

Winter 1985

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ON TRIAL: Can Toshiba's MSX synth beat Yamaha?

PACKAGES — Toshiba v Amstrad in big fight

HACKING — the do's and don'ts

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Our MPC 100 is the kind of quality machine only one of the world's leading manufacturers of business micros could produce.

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So even if you do just want an MSX for playing games, you could end up a loser if you don't first see Sanyo, then decide. SANYO

When it comes to MSX, we're not just playing game



What MSX?

Winter 1985 Volume 1 Number 4

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BACK TO BASICS WITH JVC'S MICRO COURSES

If you've just forked out for an MSX micro and still haven't fathomed out how to connect a data recorder let alone program, don't despair, help is at hand.

JVC is now running MSX computer programming courses specifically for the uninitiated at its Audio, Video and Computer Centre (AVC) in London's Piccadilly.

The course, which lasts for an entire day and runs once a month, costs £135. It is run by Larry Shado, who tells us that it is designed to familiarise users with their computers and peripherals.

He says, 'The classes will be kept small, no more than eight people, so that we can cater for any individuals' needs. At the end of the day, they should be able to write simple BASIC programs'.

The AVC centre will also be running courses covering video camera operation and video editing techniques.

Further information on the courses can be obtained by ringing the centre direct and talking to either Larry Shadoo or Mike Whyman on 01-491 3909.

You can also get more information by writing to JVC's head office at Eldonwall Trading Estate, Staples Corner, 6-8 Priestley Way, London NW2 7AF.

TOSHIBA'S CUT PRICE COMPUTER KIT

Competition between the major MSX manufacturers is hotting up and Toshiba's response over the last six months has been to drastically cut the price of its HX-10. First it was reduced from £279 to £239, then to £139. In the last few weeks the machine has been slashed even further, to £79!

In addition to these hefty price drops Toshiba has introduced a £99 starter pack kit incorporating a 64K HX-10 micro, HX-C810 data recorder, three software titles, a step-by-step guide to MSX computing, a blank cassette, plugs, fuses and even a screwdriver.

Toshiba's spokesman tells us, 'We've packaged the HX-10 so that first time buyers can start computing at an affordable price'.

The company has also launched a £2 million television advertising campaign to promote the HX-10 micro throughout November and December, whose aim, according to Toshiba's Steve Skuce, is to 'boost greater awareness of our products'.

The cut price HX-10 micros and starter kits will be available from all Toshiba retail dealers throughout the UK before Christmas.

If you want more details on this or any other Toshiba products, contact Toshiba on (0276) 62222 or write to them at Toshiba House, Frimley Road, Frimley, Camberley, Surrey.



Toshiba's £99 computing kit contains all the basic equipment

YAMAHA'S MUSICAL BARGAINS

Yamaha is joining in the MSX price war currently being fought between the major MSX manufacturers, by cutting the price of its 32K CX-5M music computer from £449 to £299 with the YK-10 mini keyboard thrown in. With the larger YK-10 standard keyboard, the package will cost just £349.

Sounds like a bargain to us as the keyboards alone originally sold for £85 and £165 respectively. However no software is included in the packages.

'The offer won't last for ever', says Yamaha's product specialist, Ken Cambell, 'I believe we are selling our MSX products very fast and they will probably be finished by Christmas'.

Yamaha can be contacted on (0908) 71771.



Musicians will love the Yamaha CX-5M and keyboard combination.

COMPETITION FORCES JVC TO LOWER PRICES

In a bid to boost sales and keep up with the other MSX manufacturers, JVC has drastically cut the price of its micro.

The HC-7GB, originally £279, is now being offered at the incredibly low price of £99.99.

JVC's John Seneschall tells us that price cutting by other manufacturers has been so drastic that JVC was forced to lower its prices. He adds, 'When you are stuck with stock, you're left with no option but to either sit on it, burn it or sell it at knock down prices'.

Toshiba recently reduced its HX-10 micro down to £79.99, and the Goldstar FC-200 is selling for £139.

JVC is planning to release MSX II early next year. A prototype has already arrived in the UK but no details have been released. It's hinted that in Japan research is already underway for an MSX III.



JVC has joined the price cutting band wagon with the HC-7GB

INTO ACTION

Anirog Software has four action packed sporting titles lined up for MSX users in the next few weeks.

The first title to be released will be *Jump Jet*, written by an ex-jet pilot and claimed to be a realistic flight and combat simulator. It will retail at £9.95.

Five-a-side is the second release, a one-or two player option soccer game for £5.95 followed by *Slapshot*, a fast action ice hockey game at £8.95.

All these titles will be released throughout November and in December Anirog is launching an arcade game called *Jump Machine*, which is expected to cost £7.95.

EARLY BIRD

At last Level 9 is set to release its latest graphics adventure.

Called *The Worm in Paradise*, it has been under development for the last 12 months, and will be the first of Level 9's adventures to incorporate multi-tasking.

The actual adventure is based on Level 9's view of the future and the idea is that you have to find a way out of paradise.

It's available on cassette for £9.95 and is available from most computer dealers or direct from Level 9.



Looking a bit like a credit card, the soft card is a low cost cartridge alternative

BRIGHT ALTERNATIVE TO CARTRIDGES

Three of Electric Software's games titles will be released on Astron soft cards before Christmas.

The soft card, a credit card sized alternative to cartridges, contains 16K of masked ROM. It plugs into the cartridge port of your MSX micro by means of a special adaptor.

Electric is launching a promotional campaign throughout November and will be offering *Le Mans* on soft card, along with an adaptor for £19.95. The adaptor alone retails for £7.95 and the game £15.95.

In the run-up to Christmas, Electric will be selling a duo pack for £29.95 containing *Sweet Acorn, Choro Q* and an adaptor.

The company has also just released a cassette-based game called *Barnstormer* which features the antics of a bi-plane pilot called Barnie and costs £8.95. Two more titles, *Eros* and *Pinkie*, will be released next month for £8.95 each.

All Electric's titles are available through two of the major MSX distributor networks; Nemesis, who can be contacted on 01-846 9701 and Lightning which is on 01-969 5255.

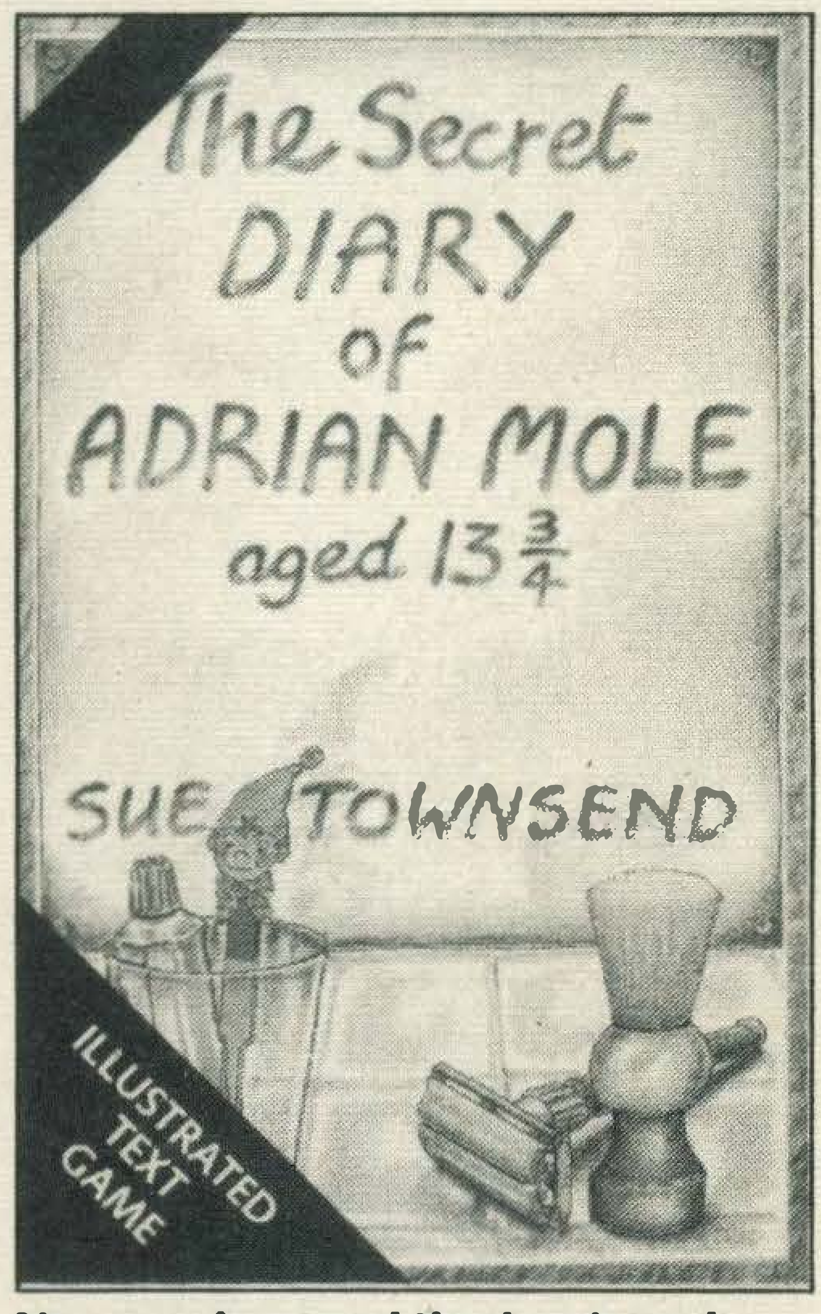
THE SECRET DIARY OF ADRIAN MOLE

Sue Townsend's best selling book *The Secret Diary of Adrian Mole aged 13¾* has not only been televised but will also be available as a computer game for MSX computers in December.

It's an illustrated text game which has been programmed by Level 9, a software house well known for producing value for money adventures, and is being retailed by Mosaic publishing.

The game will sell for £9.95 but there's also a £12.95 gift pack which includes a 1986 Adrian Mole diary.

Mosaic is also developing a MSX game based on the popular BBC TV seies *Yes Minister*, but you'll have to wait until March next year of its release.



Now you've read the book and seen the TV series, get hold of the computer game — due out soon for MSX

QUALITY UTILITY PACKAGES FROM HISOFT SOFTWARE

HiSoft has released two new MSX utilities; *C++*, a CP/M C compiler on disk costing £39.95, and *Font MSX*, a sprite editor for £9.95 on cassette.

C++ is a Kernighan — Ritchie implementation of C, the computer language, and HiSoft claims that it is one of the fastest CP/M C compilers available.

Accompanying *C++* is *ED80*, a *WordStar* compatible full screen editor. These are well integrated and, in the event of a compilation error, a programmer may transfer directly from compiler to editor to get to the source file where the error occurred.

Features include an extensive function library providing Unix-style stream-based input and output with random access abilities on files. It also has advanced data types such as structures and unions and a number of useful composite operators.

C++ is available on a 3.5 inch disk together with a 175 page manual.

Hi Soft also plans to convert its existing utility titles, *Pascal Compiler* and *Devpack Assembler/Debugger* to the CP/M 2.2 operator system for use with MSX-DOS.

More information about these products can be obtained from HiSoft on (0582) 696421, or contact them at 180 High Street North, Dunstable, Beds LU6 1AT.

GETTING TO KNOW THE LITTLE PEOPLE

Little people really do live in computers — at least David Crane, Activision's top designer, thinks they do. He and his research team at Activision have designed a system which introduces these tiny beings to prove it.

By constructing a 2.5 storey house on his computer, Crane found that the little people moved in and made themselves at home very quickly indeed.

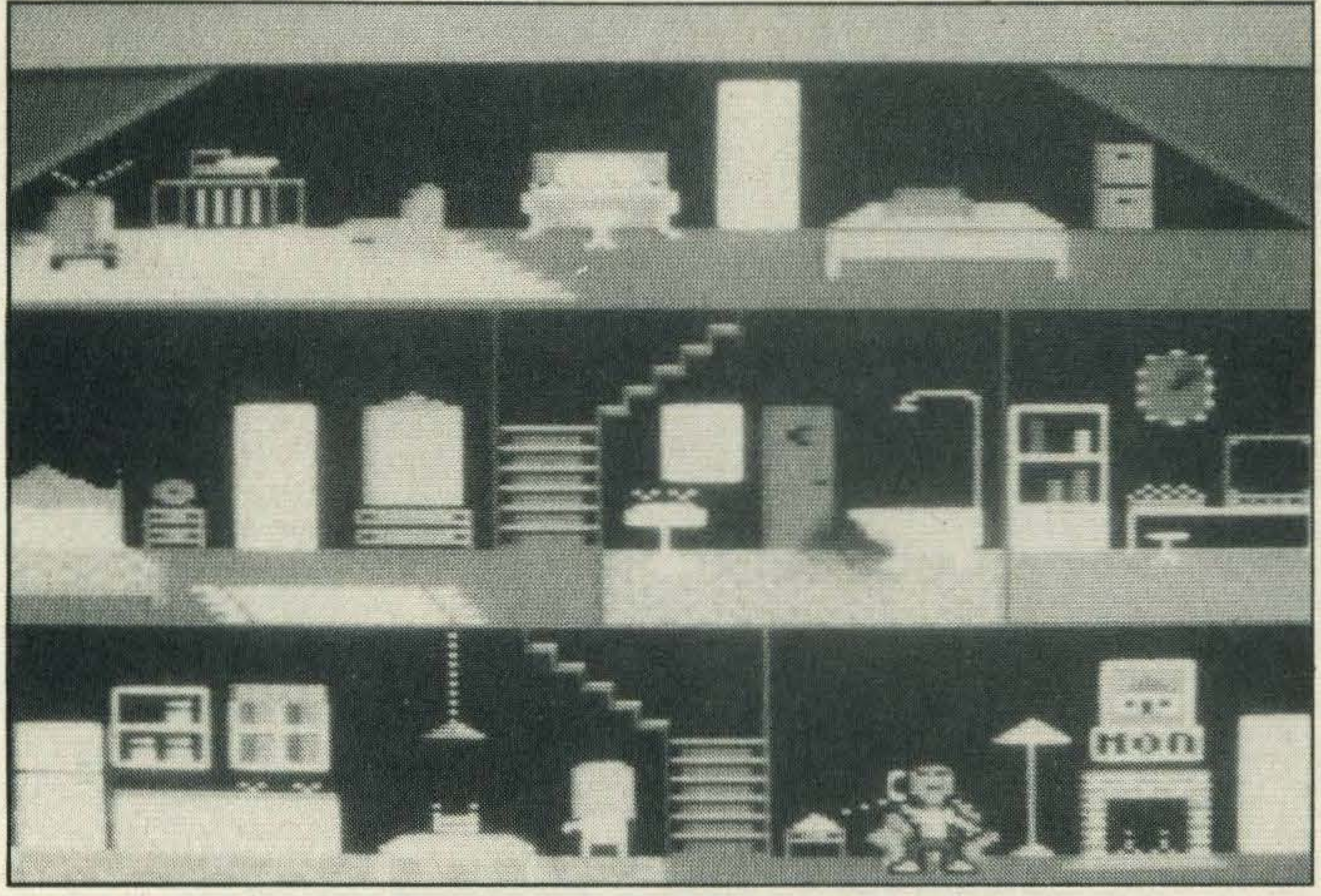
By keeping them supplied with food, water and a few luxury items like disco records, Crane found it possible to 'establish relationships with these little people'.

On screen, a dolls house-like view of the building can be seen and inside a little man and his dog are in residence. The house is furnished with all the conveniences of modern day living — a fire, record player, piano and so on. All you have to do is ask him to do things, such as play the piano, or dance.

The idea is to monitor his daily living, ask him to do things and, as Crane suggests, 'just get to know your little computer person'.

An MSX version is still in the research stages, but for sheer originality and entertainment, Activision's idea is hard to beat.

Activision can be contacted on (0628) 75171.



Activision helps you discover who's living in your micro

CLEAN UP

Cleaning tape heads in data recorders used to be a job for a dealer or a technical genius, but thanks to Robcom's alignment kit you can easily do it yourself.

The kit costs £4.95 and includes a cleaning tape, alignment tape and the all important screwdriver.

All you have to do is run the tape through your data recorder. Full instructions are included should you need to adjust the azimuth screw.

But take a tip from us — if you're not sure what you're doing or your tapes still won't load, seek the advice of your dealer.

Further details can be obtained from Robcom on 01-209 0118.

NEMESIS

Nemesis, one of the major MSX software distributors set up to cope with the increasing demands made for MSX games and utilities, has just changed its number to 01-846 9701.

Dealers and consumers were so fed up with trying and failing to get through to the former number, Nemesis decided to install four telephone lines on its new number!

The company is still at the same address — Nemesis, 2 Iffley Road, Hammersmith, London W6 OPA.

KONAMI

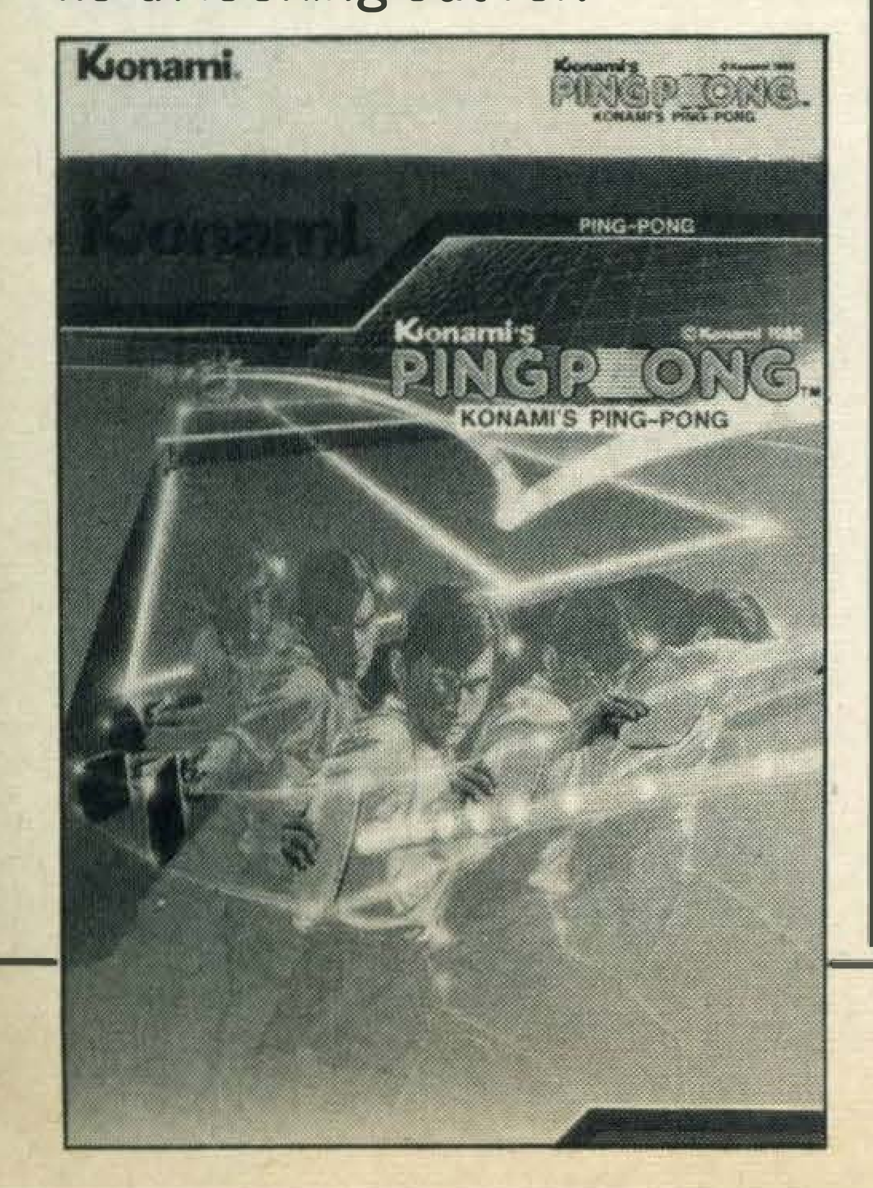
The silly season is upon us and Konami is the latest company to jump on the price cutting band-wagon.

The company's cartridges will now cost £14.95 instead of £17.40, which is good news for gamesters.

Luther de Gale, Konami's marketing manager, tells us, 'For some time we've felt that the cost of our cartridges was too high, but now that we are selling greater quantities we can pass on the benefits to the consumer.'

The company is also planning to release three more of its excellent games titles.

The first, *HyperSports III*, is a run up to the popular *HyperSports I and II*. The other two titles are *Soccer* and *Ping Pong*, and all should be well worth looking out for.



BANK STREET WRITER

Bank Street Writer, an easy to use word processor, is now available on cartridge from Toshiba for £49.95.

According to Toshiba it incorporates a number of features you would expect to find on a more expensive word processing system. It has a number of useful features including automatic word wrap; adding, moving, inserting and erasing blocks of texts; search and replace routines; word centering and indentation and text highlighting.

The product will store and retrieve text from both disks and cassette storage systems.

Bank Street was originally used on the IBM and Apple computer systems, but was developed by Toshiba in Japan for MSX micros.

GET YOUR T-SHIRTS HERE

Free T-shirts and sports bags are on offer throughout the Autumn to buyers of Elephant floppy disks.

All you have to do is obtain an application form from your local dealer and return it to Dennison Manufacturing with the appropriate number of box tops.

In return for the tops of three boxes of 10 disks, you can have a sportsbag. Two box tops will get you an Elephant cap, and for just one box top you can get a free Elephant T-Shirt.

The offer lasts until the end of December 1985.



You've got till the end of the year to collect your box tops

THE SPIDER AND THE FLY

Keeping your computer and its peripherals secure can be a problem, especially if we are to believe Product Innovation's claim that a burglary or snatch theft is committed every 60 seconds. So its newest anti-theft devices — Spider and the Fly, costing £34.95 and £24.95 respectively — might be the answer to your security problems.

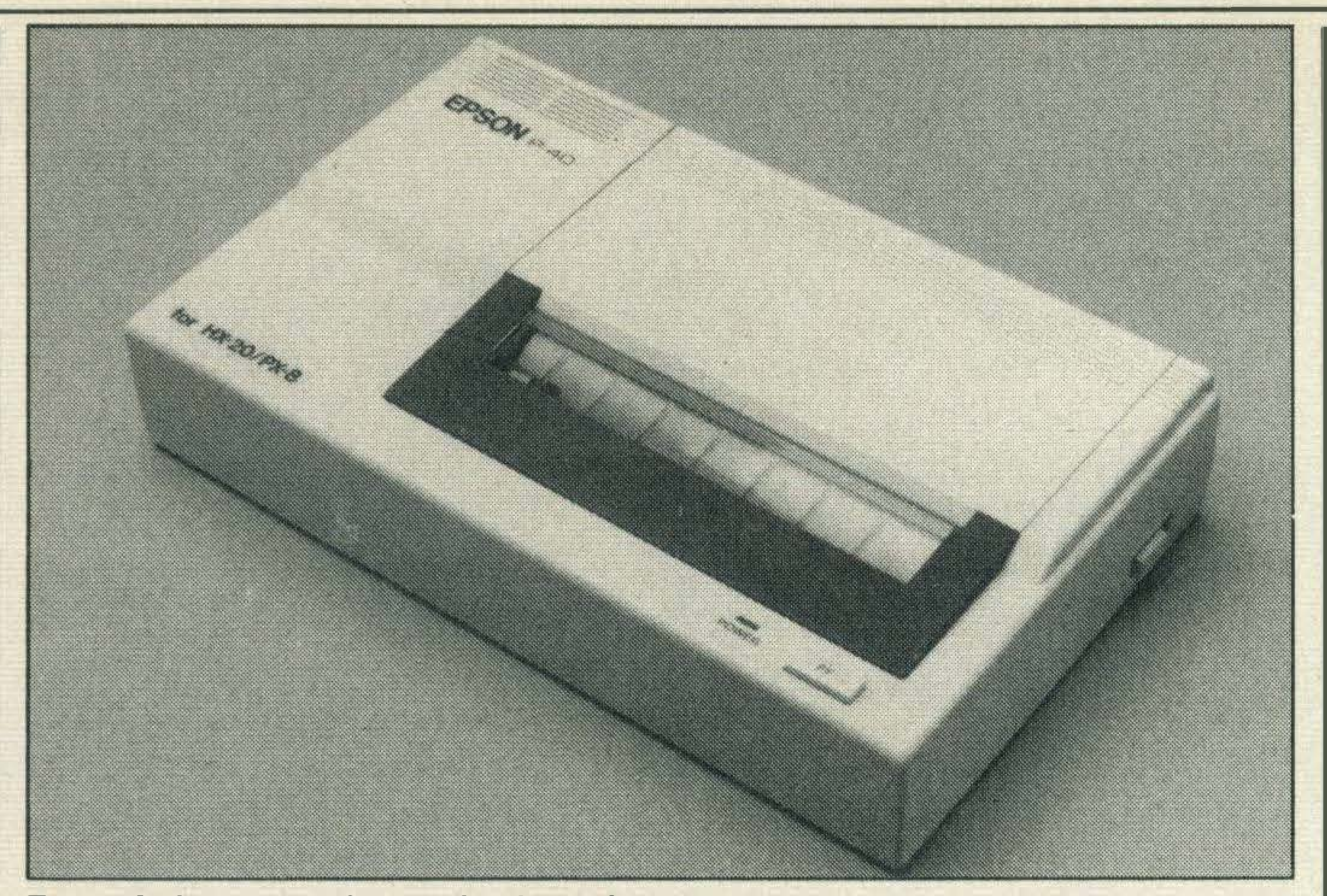
Designed to protect clusters of equipment such as computer systems, hi-fi systems, TVs and monitors, the Spider webbs everything together.

It comprises a central alarm unit with four tentacles made from 4-core wire. Each of the wire ends is fitted with special sensor attachments. These devices fit to equipment using sticky pads and a 98 decibal pitch hooter sounds if anybody tries to remove them.

The Fly consists of an alarm unit and also fits to objects using sticky pads. It detects the slightest movement and emits the same sounds as the Spider.

Both alarms last for two to three and half hours, although the Fly's alarm resets if it remains still for five seconds.

For more information contact Product Innovation Ltd, 7, Berners Mews, London W1P 3DG. Tel: 01-580 7636.



Epson's low cost thermal printer is so compact

A LIGHTWEIGHT PRINTER

If you're after a low-cost thermal dot matrix for your MSX then Epson's P-40 might fit the bill.

Although the model has been available for nearly a year it could formerly only be purchased through Epson's own dealers.

The company now wants to attract home users and is making the P-40 available on a nationwide basis through Boots' computer departments and most major computer dealers.

The P-40, which costs £59.95, weighs only 0.7Kg, has a printing speed of 45cps and a full 96 character ASCII character set.

Further details can be obtained from Epson UK at its offices in Dorland House, 388 High Road, Wembley, Middlesex.

A NEW IMPROVED GRAFPAD

An improved version of British Micro's Grafpad is set to hit the high streets in time for Christmas.

British Micro developed a protype Grafpad earlier in the year but the project was shelved because the software wasn't of a high enough standard.

The new model, known as Grafpad II, has been totally redesigned and is expected to cost around the £70 mark.

LIGHTNING TAKES OVER STAR'S PRINTERS



Lightning has clinched Star's distribution rights

Lightning, already known for its fast firing range of joysticks, has clinched a deal for the distribution rights of Star Micronics' range of printers.

Star only started up its UK operations in March this year and has spent the last few months looking for a distributor.

The initial range of printers being handled by Lightning includes the SG10 dot matrix series with prices ranging from £194 to £352.

All of the printers have Centronic interfaces and can be used with most home micros including MSX.

Details can be obtained from Lightning, 841 Harrow Road, Harlesden, London NW10 5NH.

NO MORE POWER CUTS

Power cuts can be disastrous for computer users but Richardson Computers seems to have come up with a solution.

For £199 you can buy one of its battery powered support units known as Reserve, which automatically cuts in when your mains power fails.

According to managing director John Richardson, the unit can support a home micro plus printer for at least six hours.

If you store a lot of data which you can't afford to lose, this could be a product worth investing in.

Further details from John Richardson Computers, Unit 337, Walton Summit, Bamber Bridge, Preston, Lancashire PR5 8AR.

DAISY WHEEL

The popular Juki 6100 daisywheel printer has been superceded by an improved version known as the 6200.

Micro Peripherals, which distributes the Juki range, says that the Juki 6200, although more expensive at £499, is a much faster printer with a speed of up to 32 cps and a 3K buffer. In addition, it can handle up to 197 characters per line.

The 6200 has a standard Centronics interface which makes it suitable for use with any MSX micro, and is ideal for the small business user. Details can be obtained from Micro Peripherals, Hassocks Wood, Wade Road, Basingstoke, Hampshire.

EPSON CABLE

Epson, the well known printer manufacturer, has plans to produce a printer interface cable specifically for MSX.

This cable will enable printers such as its new GX-80, which incorporates a printer interface cartridge/cable assembly instead of a parallel or RS232C port, to print out the whole MSX character set.

Costing £50, the cable should be available by the middle of January, an Epson spokesman tells us.

HOW DO YOU MAKE A COMPUTER SHARPER?

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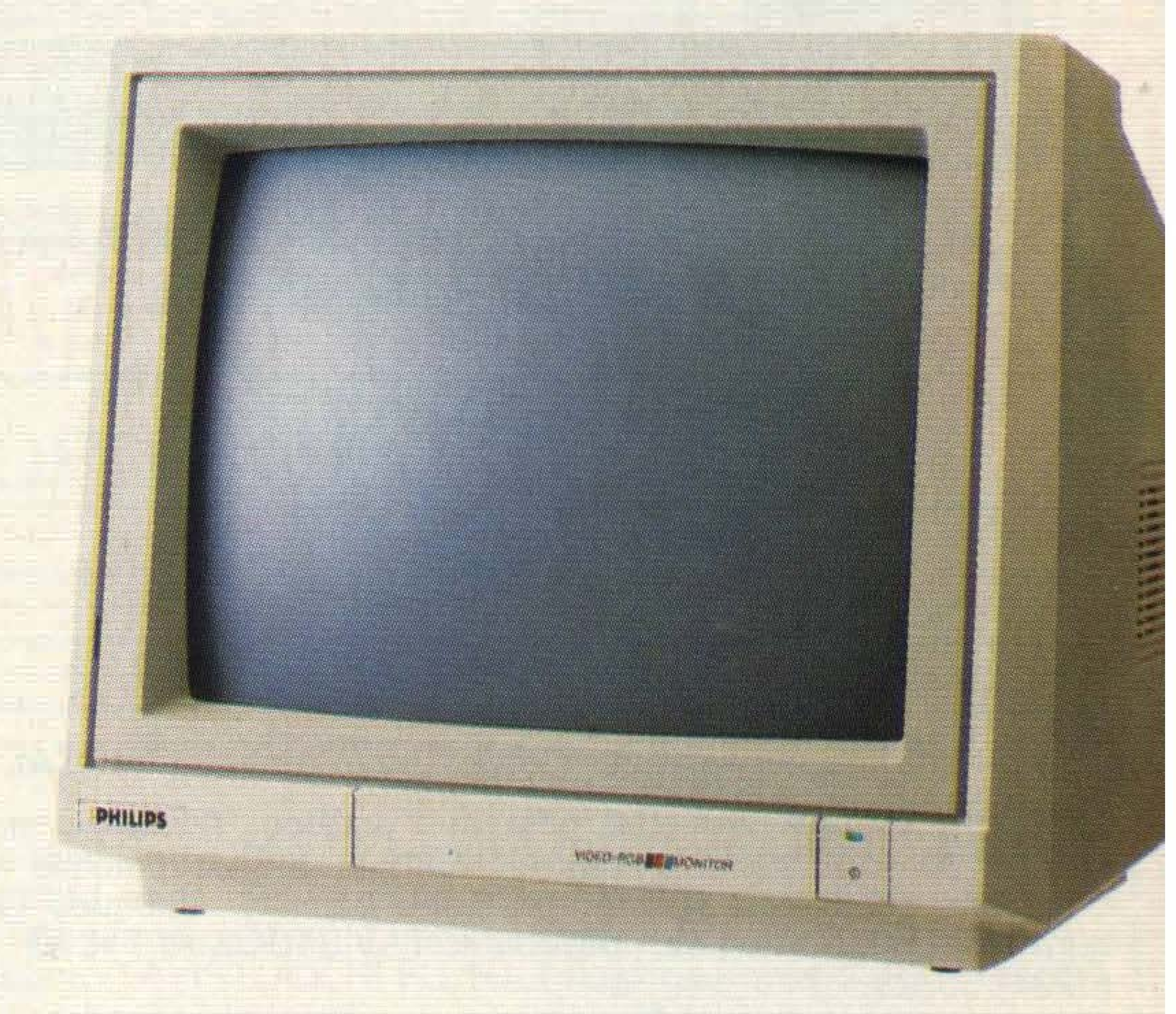
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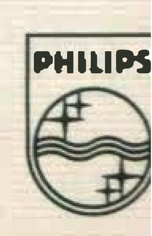
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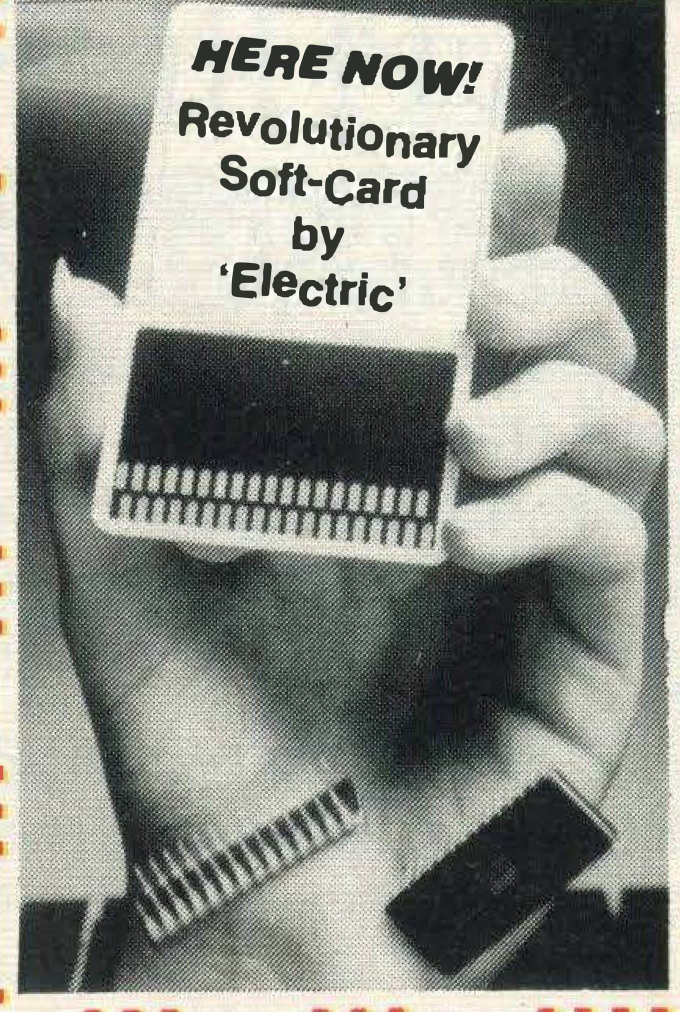
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SPOTLIGHT ON THE FUTURE

An improved MSX standard is waiting in the wings. Here's a short preview

Since the MSX standard was first announced just over two years ago, over one million MSX computers have been sold worldwide. Not content to rest on their laurels, the various manufacturers involved in the project have been working on improvements to the original MSX specification.

If you were lucky enough to attend the recent *Personal Computer World Show* you might have seen some of the latest MSX development work.

A number of surprising new peripherals were displayed. Along with the everyday disk drives and printers, there were a couple of music-based items being put through their paces. There were even one or two new MSX computers — Toshiba's HX-22 model for example. But what really made the show interesting was the formal announcement of the first major enhancements to the MSX standard, otherwise known as MSX 2.0.

Usually, an announcement of this nature would send cold shivers down the spine of the dedicated micro user. All too often, the term 'upgrade' implies 'starting from scratch'. Considerable investments in both hardware and software can be lost overnight if a user wants to take advantage of an enhanced machine. Sinclair devotees will be very familiar with this 'upgrade syndrome'.

Fortunately, MSX owners have nothing to fear. The total software compatibility philosophy embodied in the current generation of MSX systems also extends to the next generation. Software in all forms (disk, cartridge and cassette) will run without modification, and future MSX systems will happily accommodate the current range of peripherals such as printers and joysticks.

So what will or won't the next generation of MSX micros offer us? The first surprise is that the central processing unit has not been upgraded in any way whatsoever. There has been no move towards 16-bit processing: the Zilog Z80 is stil the chip that pumps life through the system.

This reluctance to improve the number crunching and memory addressing capability of the processor may merely be a question of economics. The present 16-bit processors are nowhere near as cheap as their older 8-bit counterparts.

Chips like the Intel 8088 and Motorola 68008 could have been possible contenders, as they both utilise an 8-bit data bus. This would allow a more powerful computer system to be built without the considerable production costs required for a full-blown 16-bit system.

The MSX manufacturers seem agreed that leaping into the 16-bit home computer field is a little impetuous, and would rather wait until the relatively recent 16-bit market becomes more settled.

Most of the current MSX systems have fine keyboards, and in combination with a disk drive, can be ideally suited to business applications. Their main disadvantage to date has been the lack of an 80 column display mode. For serious word processing this facility is a must, and for most applications, the more information presented on screen at once, the better.

Your only current route to better business computing is to purchase Spectravideo's 80 column adapter, or the Spectravideo X'Press micro, which has an 80 column mode built-in. With the announcement of MSX 2.0, this feature is now standard.

Graphics

This new screen mode is achieved courtesy of a marvellous new video chip which admirably addresses the criticisms levelled at the current device. The present video device, the Texas 9918, is beginning to look a bit dated in terms of the range of features it offers and has been superceded by the new V/9938. This chip was not designed by Texas Instruments, but is nonetheless totally software compatible. The V9938 was custom built for MSX 2.0 by Microsoft, and it offers not four, but 10 graphics modes.

The highest available screen resolution is 512×424 pixels, and the colour palette (the total number of colours available) has been increased from the adequate 16 to a staggering 256 colours. The sprite display has been modified to accommodate eight instead of four sprites on a single horizontal line. Also, sprites may now be composed of more than one colour. By alternating the colours of each line of the sprite's definition, multi-hued sprites may be created.

All the additional sprite and colour information needs to be stored somewhere. In present MSX systems, a 16K block of memory is dedicated to the video display. For the purposes of MSX 2.0, this has been upgraded to a massive 128K.

The advantage of having separate RAM to store the various screen tables, is that none of the main RAM used to store your programs and data need be sacrificed for graphics.

The new video chip may also



interface with video signals input from an external source, such as VCRs and video cameras. Mitsubishi has utilised this latter feature in its remarkable new MSX 2.0 system.

Mitsubishi

A device known as a digitiser may be attached to the computer. This is used to 'grab' a video image and display it using one of the MSX 2.0 graphics modes. Once present in the computer's video memory, the picture can be manipulated using an item of software called *Artpaper*.

Artpaper is a ROM-based artist's program with a difference. You can draw pictures with it just as you can with the Sanyo light pen's bundled software, but its main purpose is to allow editing of digitised pictures.

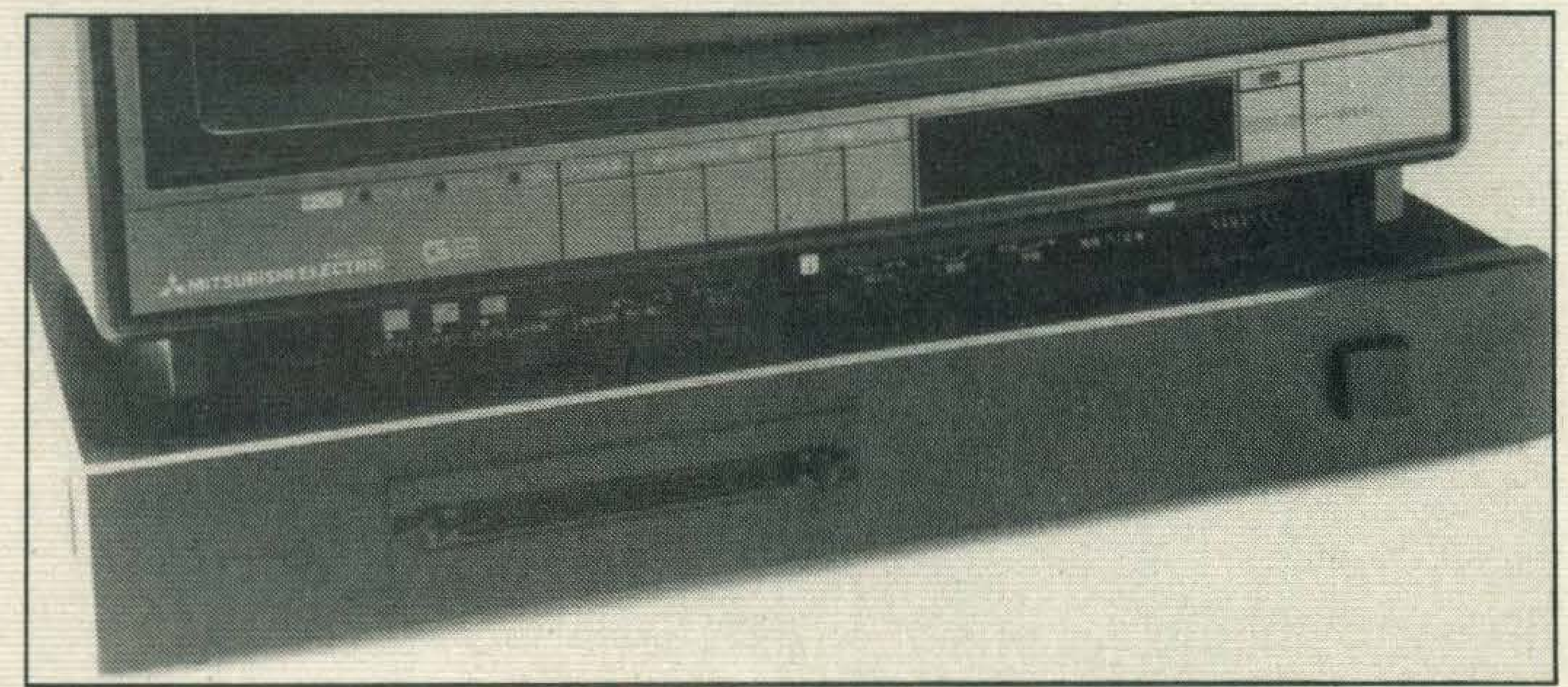
The package's menu is comprised of an array of 'icons'. These are simply pictorial representations of the commands available to you.

On most systems, you would select a command using a joystick to move the cursor over the command icon and pressing the trigger button. The Mitsubishi system uses another means of moving the cursor. A two button 'mouse' can be used. The movement of the mouse across a desktop is mirrored by the cursor on the screen. The mouse device has been specified as a standard optional extension within the MSX 2.0 standard.

From the icon menu, a wide range of drawing instruments can be selected. There are the usual paint brushes, pencils, eraser, aerosol and paint-fill options you would expect. Lines, boxes, circles and ovals can all be produced with a twitch of the mouse's tail. A picture may also be annotated by adding text from the computer keyboard. All of this is fairly standard. Where the system comes into its own is when you start to use the editing functions.

The software equivalent of a pair of scissors and a tube of glue can be used to cut pieces out of your picture, move them around the screen and paste them into a new position. Using this technique, numerous duplicates of a small section of the screen can be created and laid out over the entire screen,





Mitsubishi's prototype MSX 2 (above) and digitiser (below)

or stacked on top of each other like a deck of cards.

Another option allows you to stretch or shrink an area of the screen. You can also 'flip' this area around, so allowing the viewing plane of an image to be altered. At the very least, you can mirror an image; at other times you can subject the image to some strange distortion effects.

The higher resolution screen is used to display captured video images when subject detail is more important. The disadvantage of this screen mode is that it may only display a maximum of 16 colours at one time. Obviously, the lower screen resolution will not give you as sharp a screen image, but a picture will be shown using the full range of 256 colours. This resolution is particularly useful for dramatic abstract effects. You can, of course, save and load your efforts to tape. In due course you will also be able to print-out digitised images.

With the MSX 2.0 video chip, a superimpose feature allows you to mix both static, computer generated material and 'live' action from a video camera or recorder. This feature could be used to produce an edited video tape, complete with a title sequence and subtitles.

Unfortunately, the system is not yet available in Europe, nor is it likely to be for a good number of months. It is likely to be too expensive as a novelty purchase for most users — around £800 for digitiser and computer — but it clearly demonstrates the major advances that have been made in MSX graphics over a relatively short period of time.

Sound

As far as sound is concerned, the basic three-voice sound chip is still the basic requirement of any MSX 2.0 system. As with the mouse, a superior sound chip is an optional, yet still standardised addition to the MSX specification. This seems very likely to be of the type used by Yamaha in its CX-5M computer, and by Toshiba in its new add-on Music System.

The chip will use the FM synthesis technique for producing sound. A number of waveforms are combined and interact with each other to produce a very rich and quite complex range of sounds. Anything from a church organ to a koto can be produced with a high degree of realism and clarity.

Another useful feature is that the sound is of a high enough quality to warrant playing through a hi-fi system. Stereo sound is also possible with such a sound chip.

Instead of three voices — or sound channels — the MSX 2.0 sound chip offers nine. Full polyphonic, multi-part music is easily achievable with such a system.

Another welcome addition is a battery-backed-up RAM. This is a small amount of memory in which personalised system information may be stored. When the system is turned on, the start-up screen colours, mode and width can be set automatically. A greeting message can also be provided.

For the business user, the date and time can now be provided from the system clock. As the RAM is backed up by battery, the system will always remember the current date and time.

In this security conscious world, Microsoft has provided password security. This means that the system is useless to you unless you know the password. Without it, you won't get any further with the system than turning it on. The day of the truly personal, personal computer has arrived in the home.

Basic

All the new hardware features are complemented by additional BASIC commands. The current 32K BASIC ROM in the MSX 1.0 systems has been beefed up to 48K.

Further extensions incorporated in MSX 2.0 are a basic 64K of RAM, Centronics printer port and two joystick ports. These are nearly all standard on the current range of MSX computers available in Europe. In Japan, a number of minimum specification with only 16K of memory and one joystick port are available, but, quite wisely, these systems never made the trip to our shores.

Although the Z80 processor can only access 64K of memory, a technique known as 'bank switching' allows MSX systems to address a total of 1 Megabyte. MSX 2.0 has improved the memory addressing still further so that a massive 4MB of RAM can be placed at the fingertips of an MSX owner.

The MSX 2.0 systems are just emerging in Japan, so, going by past experience, we won't be seeing them here for at least a year. They have emerged as very credible business systems, and yet still manage to improve their appeal to games players.

If the Mitsubishi system is anything to go by, we should see a number of innovative new systems with a wide range of applications. And best of all, MSX 2.0 will still offer total compatibility. ■

DIAL-A-DATA

Hacking is not just reserved for teenage whizzkids — anyone can do it. We explain how.

Deep under the Cheyenne Mountains, near Colorado Springs, lights flicker to life on the screens of Norad's early warning systems. Voices became hushed as the realisation dawns that this could mean just one thing — an attack by the Soviets. Rapidly the armed forces of the USA move to red alert.

Meanwhile, in a back bedroom in Rickmansworth, a teenager tracks the same points of light on his home computer. Commands fly from his keyboard, across international telephone lines, and into Norad's giant mainframes. Eventually, bored with the game, the teenager types 'Only kidding', cancels the attack and hangs up the phone.

That's one popular image of computer communications — that is, linking computers by telephone. It's an area which achieved notoriety with the film *Wargames* and publications like *The Hacker's Handbook*.



The truth, fortunately, is safer and rather more down to earth than the image. The great popularity which communications — or *comms* to those in the know — is enjoying among computer enthusiasts owes more to its genuine attraction than any micro fantasy. Put simply, hooking into other computers, from micros to mainframes, is one of the most fascinating things you can do with your MSX machine.

Before going into detail about the available online systems, let's look at a couple of the terms used. The most common one in communications is *baud rate*. This is a measure of how fast data travels between computers, and is roughly equal to bits per second.

Normal telephone lines aren't the most wonderful data carriers, so the limit is about 1200 baud (around 1200 bits per second). A large number of systems use split baud rates, the data coming to you at 1200 baud, and you sending data at a more reliable, but much slower 75 baud. The reasoning is that you're probably going to be sending comparatively little data, but receiving a lot.

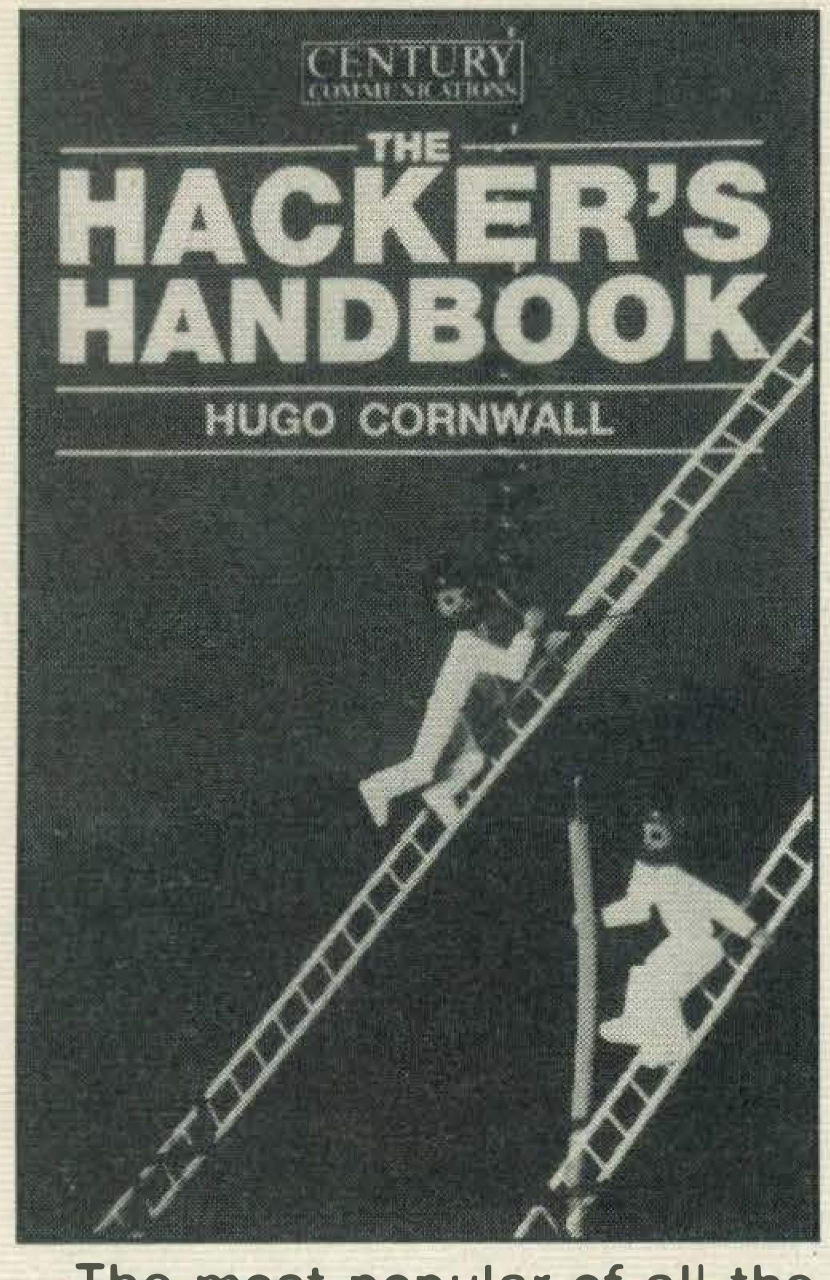
Apart from 1200/75 the only other common system is 300/300 — sending and receiving at the moderately fast but still reliable 300 baud. Some business and scientific networks use 1200/1200, but these are of little interest to the average enthusiast.

YOUR PHONE BILL

No matter what system you're accessing you're going to end up paying a bigger phone bill than usual. You can forget those stories about people accessing telephone company computers and wiping out their bills — it's extremely difficult and highly illegal.

The first rule in comms is 'keep an eye on the time'. When you're wandering around a database the units can clock up at an appalling rate. Most bulletin boards will show you how long you've been online, which is useful, and will probably scare you into hanging up.

Fortunately, Prestel can be accessed at local call rates from almost everywhere in the country.

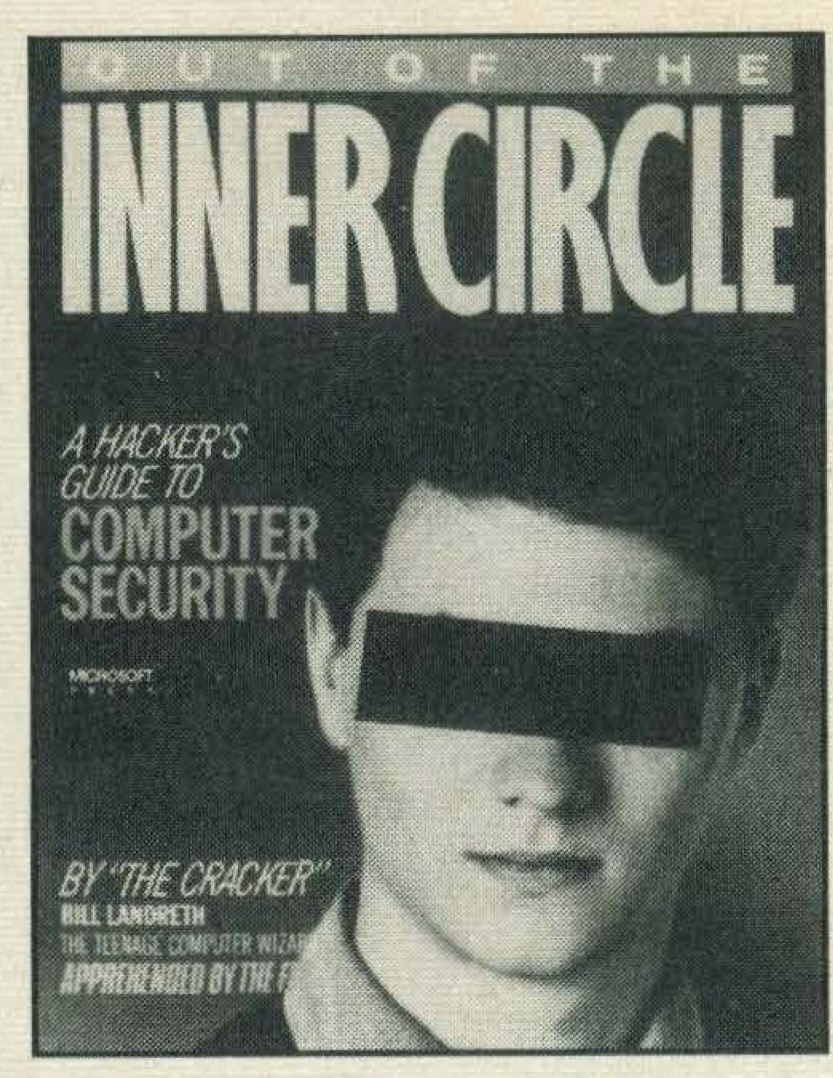


The most popular of all the systems is Prestel. This online database service is run by an offshoot of British Telecom, and was initially a huge flop. But that was because you needed a special receiver to access it. More recently it became possible to use existing computers, assuming they have the right equipment and software (see box), and suddenly Prestel was opened up to hoardes of home micro enthusiasts.

Prestel is what's known as a viewdata system. It runs at 1200/75 baud and is based on pages of information, with colour and graphics, similar to the teletext information you can get on suitably equipped TVs. Each page is numbered and simple routes are provided between associated pages. In fact, you need only the number keys, and two special command keys (usually function keys on micros) to find any of the third of a million pages.

There is the usual weather, business, holiday, sport and entertainment information. But of most interest to micro owners is Prestel Microcomputing. This is a closed user group (CUG) and can be accessed only if you pay the extra subscription fee. But that gives you access to Micronet 800 and Viewfax 258, as well as other areas of interest to computer enthusiasts.

In these sections you'll find information on computer clubs, programming tips, software reviews, adventure helplines and the latest news from the computer world. It is also possible to download software — some of it free, the rest at reduced prices. However, there's no software for MSX micros as yet.



The increasing popularity of computer communications has inspired several books

Once you've forked out your subscription (£6.50 per quarter for Prestel alone, plus an additional £10 for Micronet), most of Prestel is free. Each frame shows a charge, but in the majority of cases this is 0p. Charges are made, however, for many of the games and business pages, some weather reports and the like. There are also online time charges during peak periods — 08.00-18.00 weekdays, and 08.00-13.00 Saturdays. The other times are free.

Prestel

As its function is to supply information, Prestel is pretty passive. You spend most of your time just reading pages. But you can send information too. There are bulletin boards for broadcasting to the world — including the *Gallery* section where you can set up your own mini-database.

You can also send messages to specific people, simply by knowing their mailbox numbers. This is what's known as electronic mail. After the message is sent to someone, the next time he or she logs on to the system a notice flashes on the screen to say that a message is waiting.

You can also book hotels and holidays, and order brochures through response frames. That's why a lot of travel agents use Prestel. But on the whole, Prestel is for reading.



Information on Prestel

A more sophisticated system is Telecom Gold, which has a section dedicated to MSX users, known as MSX-NET. Telecom Gold is designed primarily as an electronic messaging system. It's sophisticated, and can be used to send electronic messages and telexes worldwide. As such, it's of most interest to businesses.

However, although it lacks the colour and graphics of Prestel, there are some entertaining sections on Gold. There is the facility to chat to other users who are online at the same time. And there are some interesting games, including an excellent adventure, known as *The Pits*.

The great disadvantage about Telecom Gold is the cost. As well as your membership, you have to pay online charges and storage charges for any files. This can all work out quite expensive.

Even more expensive are the professional databases. One of the best is *World Reporter*, which adds the full text of every issue of the *Guardian*, the *Economist* and several other well-known newspapers and news services to its already vast database.

The system has a sophisticated search facility and is ideal for journalists and other people involved in research. Unfortunately, it costs a pound a minute! You can easily run up a bill for £30 just finding and printing out one article.

In contrast, bulletin board systems (BBSs) are absolutely free (if you ignore your phone bill). Just as they sound, BBSs are essentially electronic mail systems, with large public message areas, although some now have games and downloadable software.

BBSs are run by enthusiasts,



Prestel offer so much . . .

Use it to book tickets



To log onto any of the communication systems, you first need a modem

usually on simple micros. Most use a text-only scrolling format. Although they traditionally run at 300/300 baud, many are also adopting 1200/75. The main problem with BBSs is that only one person can access a board at a time, so you'll usually find the numbers engaged — you just have to keep on trying until you get through.

On the other hand, these systems are great for being able to contact other like-minded people. You'll be able to get advice on everything from programming bugs to marriage, simply by putting up a message in the public area.

New boards are springing up all the time — and, of course, they close down too. The main reason for a board closing is people calling at the wrong time. Although many boards run 24 hours, others don't, as the phone line is also used for normal voice calls. The sysops (as the system operators are known) become understandably fed up when idiots ring at the wrong times. A board's operating times are usually well-advertised, often on other boards, and they should be respected.

Adventures

As well as the general message areas, most bulletin boards also have Special Interest Groups (SIGs) for messages and information about subjects like computing (surprise!), sales, wants and MUD.

That last subject has nothing to do with wallowing in wet earth. MUD (Multi User Dungeon) is an online adventure game, but with a difference.

It is an adventure which can be played by scores of people at the same time. And many of the characters you meet while exploring the locations will be other players.

The original MUD is on an Essex University computer, but is difficult to access. Now British Telecom is producing a commercial version which, at the time of writing, was still undergoing tests.

Many people will still prefer the original version — not because it's better but because there is a certain mystique surrounding it. Originally intended for university students, MUD quickly fell prey to hackers.

These are people who enjoy logging on to other people's computers — expecially when they're not supposed to. In recent months the press has been full of stories about teenagers gaining entry to NASA's mainframes, entering telephone company computers and killing their bills, and so on.

Undoubtedly a lot of this high-level hacking does occur. And the James Bond aura surrounding it has been partly responsible for the increased interest in communications generally.

Bulletin boards are full of messages from comms newcomers asking, 'How do I hack computers?' or, 'Does anyone know any interesting telephone numbers?'.

In fact, most hacking is done by obtaining inside information (such as passwords) in ways totally unrelated to computing — in other words, normal industrial espionage.

The story which opened this article is pure fantasy. Even if you find a telephone number with an interesting computer at the other end, the chances are you won't get past the prompt which simply says: Password?

Trying all the possible password combinations could take anything up to a few thousand years, even if you get the computer to do it. The most interesting thing you're likely to see on your screen is the message 'Access denied'.

But even if you can't launch ICBMs with your MSX micro, communications is still one of the most fascinating areas of computing. ■

WHAT YOU NEED

Unfortunately, communications isn't just a matter of plugging the phone into your computer. To convert computer signals into pulses suitable for sending down the telephone line you'll need a device known as a modem (MOdulator DEModulator).

Not all modems can handle all baud rates or systems, but if you plan to get into comms seriously it's worth forking out for a multi-standard model, capable of handling both 1200/75 and 300/300 baud.

You'll also need some software. Like the modem it's a good idea to go for the most versatile you can get. The Computermates cartridges are ideal as they can handle both viewdata and normal scrolling systems. If, on the other hand, it's just Prestel you're interested in, then the new cartridge from Micro Technology is worth a look.

Once you've got the modem and the software all you need is a phone and a healthy bank balance to pay the phone bill!

CONTACTS AND NUMBERS

For more details on the services mentioned, contact:
MICRONET 800/PRESTEL: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: 01-837 3699
TELECOM GOLD: Sales Administration, 60-68 St Thomas Street, London SE1
MSX-NET: 3 The Barracks, Main St, Gawcott, Buckingham MK18 4HR
MUD: MUSE Ltd, 6 Albemarle Way, London EC1V 4JB

To get you started, here are a few of the more popular bulletin boards. All are on 24 hour operation and many contain full lists of UK BBSs.
Dark Crystal 01-954 9847 300/300 and 1200/75 baud
MBBS Mithcam 01-648 0018 300/300 and 1200/75 baud
Microlive BBS 01-579 2288 300 baud
NBBS Essex (0277) 228867 300/300 and 1200/75 baud
TBBS Liverpool 051-428 8924 300 baud
TBBS London 01-348 9400 300 baud



WHAT'S THE SCORE?



TOSHIBA vs YAMAHA

Can Toshiba's new Music System beat Yamaha's CX-5M? Graham Bland investigates

Although the standard sound chip in MSX micros offers the arcade enthusiast a healthy diet of weird and wonderful sound effects, those who strive after the more refined tones of Handel or Bach may be disappointed with the musical output of their machine.

There are some very good pieces of software, notably *Oddessy-K* and *PSG Musiwriter* from Rittor Music, and *Music Editor* from Morwood, which do wonders with the limited hardware. However, to produce good music, you will need to upgrade the quality of the chip that produces the sound.

Yamaha, which is a very well known and respected producer of music synthesizers, did just that when it included an FM synthesis sound chip in its revolutionary CX-5M micro. Other manufacturers have cocked an envious ear in the direction of Yamaha, with the result that one of them, Toshiba, has boxed up a sound chip as an add-on for MSX systems.

Yamah's CX-5M is outwardly a standard 32K MSX micro with the addition of one or two non-standard connectors. One of these allows a music keyboard to be attached.

This is around 3½ octaves long and is one the popular 'mini-keyboards' such as those found on the Yamaha 'Portasound' and Casio range of portable musical instruments. There are 44 notes in all, ranging from F to C. For an additional £50, the player may wish to opt for the full-sized JK-10 keyboard.

The keyboard will do nothing until you go into BASIC, and type CALL "MUSIC". A menu will appear on screen and the keyboard comes to life. You now have a very sophisticated music synthesizer on your hands.

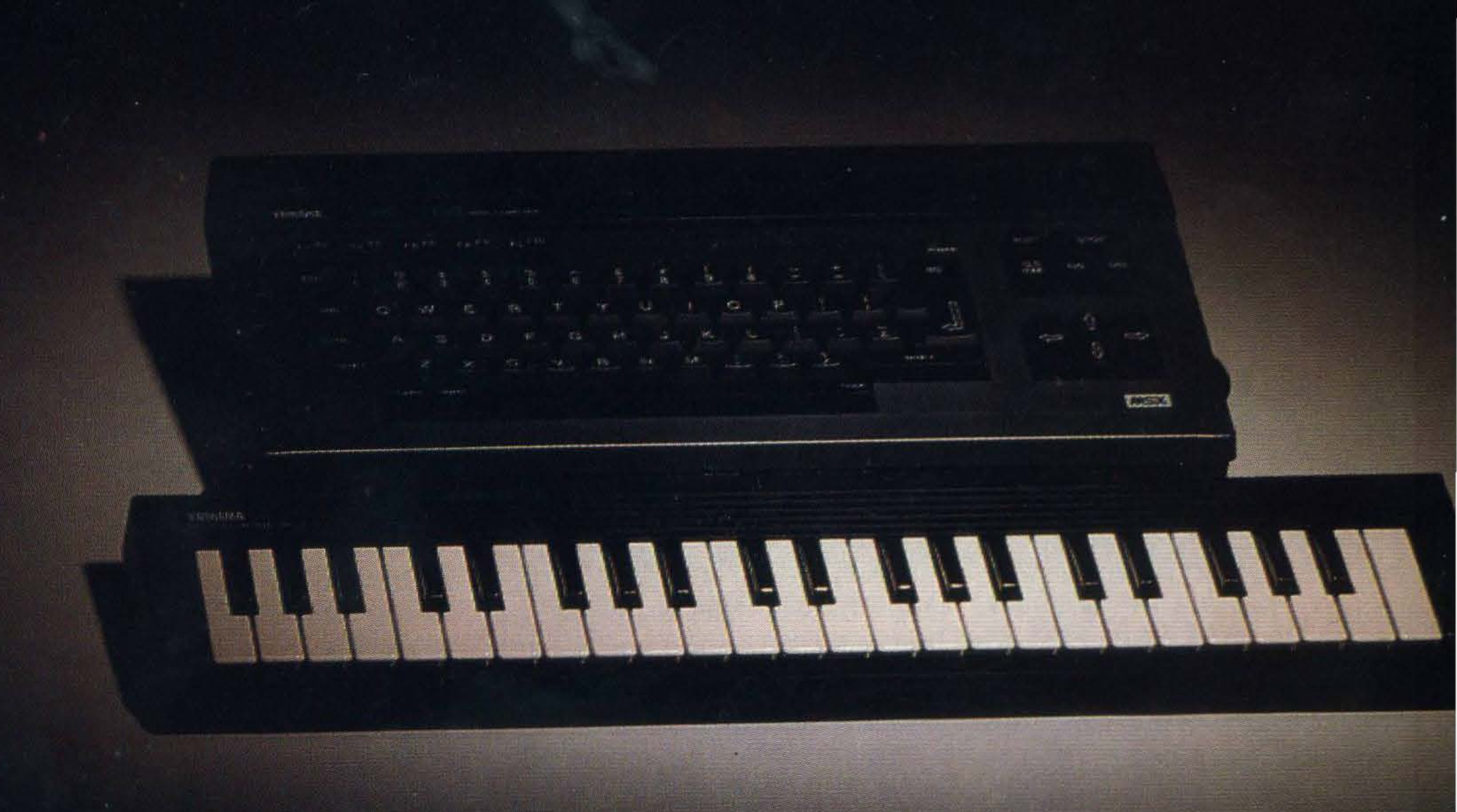
Instead of the rows of knobs and dials you may associate with electronic instruments, the CX-5M chip is totally controlled by software.

The control panel is split up into five sections. Generally, these determine the instruments (or voices) which may be played using the keyboard, rhythm, bass and chord acompaniment, modulation effects and finally overall sound balance of the instruments, as well as tuning and transposing of the entire keyboard.

The menu is traversed using the function keys, while individual items are changed using the cursor keys.

At the bottom of the screen are a set of commands which may be given by pressing keys on the computer keyboard.

Initially, the keyboard is 'split' in the middle. The lower part of the keyboard allows more than one note to be played at a time (i.e. polyphony), while the upper



section of the keyboard is monophonic, and best suited to solo playing. Effects like portamento may be added to the solo section.

The keybord split may be set at any point, and the solo and polyphonic sections may be swapped, i.e. poly on the upper section and solo on the lower.

A different voice may be assigned to each half of the keyboard. There are 46 voices in all. These range from the superb organs, harpsichord and clavichord to odd effects like train whistles and ambulance sirens.

The sound quality is stunning, particularly if you link the system up to a hi-fi. Normally, the music is directed to the speaker in the TV set.

You can add various effects to these instruments: sustain, amplitude and pitch modulation. The latter two will give you effects like tremolo and vibrato. The modulation effects may be altered in both depth and waveform. Applying pitch modulation with a square waveform will sound dramatically different if you use a triangle waveform.

The terminology may sound boggling, but at this stage, you can simply experiment until you get the sound you like.

You may add an automatic backing section with any combination of rhythm, bass line and chord. The rhythms offered are just the standard rock, disco, etc. beloved of organ manufacturers. They are not particularly realistic but are a vast improvement on a metronome.

Automatic chords (major, minor etc.) may be produced by playing up to four keys on the lower 14 notes of the keyboard. Various chord instruments may be used; flute, guitar, horn and brass.

A piece of music may be recorded in the CX-5M's memory. Up to 2000 notes may be stored in 'real-time' (i.e. exactly as you played them), and played back at leisure. For more permanent purposes, the piece may be saved to tape.

As it stands, the Yamaha is a fine instrument, with enough facilities to keep you happy for a long while. The dedicated can coax yet more from the synth by using the range of cartridge software available.

The FM Voicing program is supplied in the box. If you tire of the preset sounds on offer, you can build up a library of your own.



The Toshiba music keyboard will interface with any MSX computer with over 32K RAM

The best way to begin is to take one of the preset sounds and start to experiment with it. With a great deal of hard work, it is possible to produce absolutely incredible voices.

Once created, the sound may be stored to tape, and the 'patch' — the parameters used to create it (of which three are a great number) — may be dumped to a printer.

To become competent with the CX-5M voicing capabilities will take many months, but it is a worthy undertaking.

The FM Music Composer allows music to be written on a stave on-screen and played back. This is a cumbersome piece of software and can be quite tricky to use. Perserverence isa gain required. Multi-part music may be written and edited, with a final printout of the score when you are finished. Some knowledge of musical notation is definitely a must.

Yet another cartridge, the FM Music Macro, allows you to access the FM sound chip from MSX BASIC. This expands the list of BASIC sound commands available by means of calls to the Macro ROM.

MIDI — a universal data exchange protocol for digital keyboards — is another facet of the CX-5M. Using the MIDI interface, the CX-5M may control, or be controlled by, other suitably equipped pieces of musical hardware.

MIDI is used by the DX-7 Voicing cartridge. If you have over a grand to spare, you could plump for Yamaha's popular (count 'em on *Top of the Pops*) professional synth. By all accounts, programming the beast is a bit awkward, so the CX-5M is often used to set up its big brother's voices.

Yamaha is not the only supplier of software for the CX-5M. Other software houses are taking advantage of the system's 'open' architecture.

With the CX-5M, you are purchasing a system which is very flexible, and unbeatable at the price. Musicians who know the ins and outs of synthesizers and MIDI are in the best position to appreciate the features on offer. Very dedicated beginners will find it an easy means of breaking into the digital synthesizer market without having a prior agreement with their bank manager.

Toshiba

In contrast, the Toshiba MSX Music System's obvious appeal lies with people who currently own an MSX system with a memory of 32K or more. It seems most clearly pitched at the absolute beginner, both in terms of the ROM based control software and the facilities offered.

The main unit is a full-pitch, 49-note 'professional' keyboard, spanning four octaves (from C to C). This is plugged into the FM synthesizer cartridge, which is in turn slotted into an available cartridge port.

The FM cartridge has two stereo output sockets to allow connection of the unit to a hi-fi system. Alternatively, these outputs may be used to drive the speaker in a TV monitor.

Connection of the music system takes only seconds. After checking everything is set up OK, all you have to do is turn the computer on and you are ready to play.

The main menu screen shows graphic representations of a keyboard, drum kit, metronome and a computer with monitor. On the 'monitor' screen are displayed the three options available to the user.

Two of these are demonstration pieces of music to give you some idea of the system's potential. When a tune starts to play, the drums, cymbals and keyboard on the screen follow the rhythm and melody, and the metronome taps out the tempo.

The final and major option available from the main menu is *EDIT*, which allows you to change the instruments to be played, alter the tempo and rhythm and even record, playback and save your own compositions.

Options on the *EDIT* menu are selected using the cursor keys, spacebar and backspace keys. The spacebar usually steps up through a list of values or options, while the backspace key allows you to step down through a list. This makes the system very easy to get to grips with.

Any one of 65 voices may be selected. These range from the conventional, such as electric pianos and pipe organs, to an exotic range of Japanese

instruments and sound effects.

The latter encompasses typewriters, a 'space noise', and one called *TUT*, which the manual reliably informs us is a tut. Just the thing you need to voice polyphonic diapproval!

The voices are generally quite useful, though some of the more percussive instruments are rather similar. Sound effects like vibrato and sustain may be added to enhance the basic sounds. Unlike the CX-5M, you are limited in the amount of control available over these effects. Vibrato is either on or off, with no selection of waveform possible.

In common with the CX-5M there is a comprehensive accompaniment feature, whereby the computer allows you to play the usual one-finger chords and automatic bass lines. The computer automatically displays the current chord that is being produced in this mode.

An added bonus is that any one of the instrument's 65 voices may be assigned as a bass and accompaniment instrument.

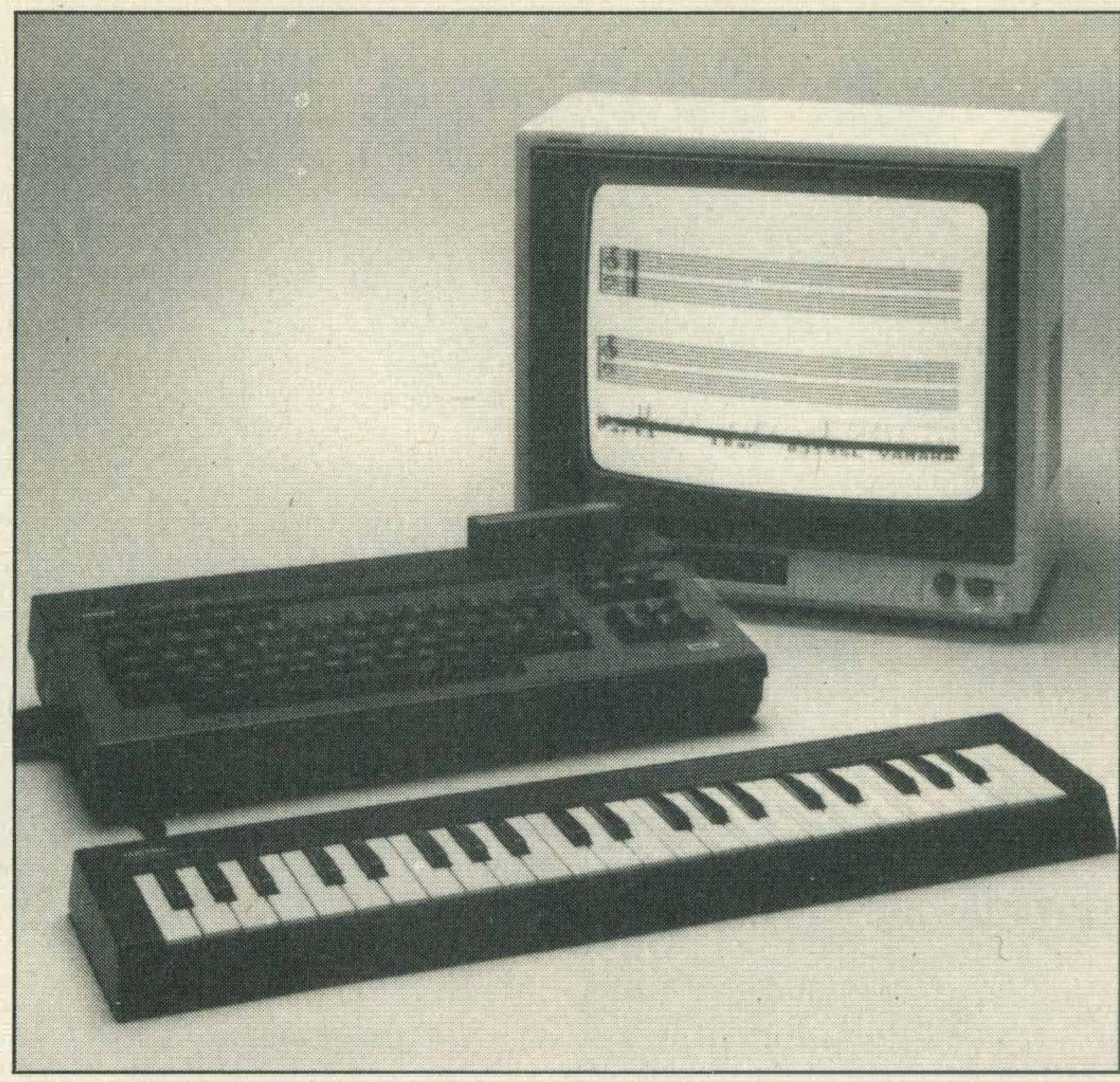
There are far more rhythms available from this system than the Yamaha: a total of 20 offer everything from funk to fusion.

The sound quality of the drums is rather better than the CX-5M, but again is rather a let-down when judged against the quality of the instrument's major voices.

There is a record feature available, whereby a piece of music is entered into the computer's memory for later playback. This differs from the CX-5M's record feature in a number of important respects. The first of these is that the accompaniment feature and melody track can be recorded and played back independently of one another.

The CX-5M records only the notes you play, while the Toshiba keyboard stores both note *and* voice date. So you could change the melody instrument from an electric guitar to a harmonica midway through recording.

In operation, this is possibly one of the nicest features of the system. As you playback a piece, you can see all the voice and chord changes on the screen exactly as you recorded them.



The CX-5M from Toshiba will appeal to musicians and keen beginners

Once you have completed a piece of music, you can save it to tape or disk for later recall.

One strong potential application of this system is for education. As the graphic keyboard display mirrors the operation of the real keyboard, a pupil may learn a piece of recorded music in a copycat fashion.

Perhaps in the near future we will see Toshiba releasing a set of music 'albums' for tuition purposes.

The last — and most interesting — feature of the system is a touch sensitive strip located above the keyboard unit. The strip is called the 'Multi-Sensor' and is an extremely 'friendly' little gadget.

Various features may be selected by touching one of the five zones of the sensitive strip. By default, these zones correspond to the five percussion instruments which make up the systems drum kit. You can tap along on the drums, or even program your own rhythm patterns by playing the Multi-Sensor.

The Sensor is totally 'soft'; software dictates the function of each of the sensor's zones. By selecting the 'Sensor Mode' option on the menu, the strip can be used to play chords, arpeggios, and select rhythms and voices. An on-screen status line shows the current layout of the sensor, rather like the standard MSX function key display.

The review system was supplied with only a simple introductory manual. An additional, more detailed reference manual will be provided for the purchaser.

Surprisingly, the 'beginners' manual is one of the best examples of its type we've yet encountered. A cute little character, Tommy the Teddy Bear from Toshiba, shows us how to have fun with our Music System.

Although blatantly aimed at the young user, after running through the manual you will have a very good working knowledge of the entire system. The approach is sometimes inconsistent, with the odd bit of high tech jargon thrown in for good measure, and the assumption that the user can read music.

Verdict

The Yamaha and Toshiba are not really competitive products, so a one to one comparison of features is not altogether fair.

The CX-5M could be classed as the dedicated musician's micro. It offers more flexibility than the Toshiba system, but it requires much more of the user. Software like the FM Voicing program unleashes the power of the sound chip, but expects a great deal of dedication on the part of the musician.

Features like the MIDI interface can only really be appreciated by those who own additional MIDI equipment like drum computers.

In comparison, the Toshiba Music system has a much lower potential for expansion than the CX-5M. It is a 'closed' system, and is unlikely to have any software written for it.

However, it is much easier to use and has a wider general appeal than the CX-5M. The keyboard unit is excellent and the Multi-Sensor is a novel and useful idea.

If you want to buy a disk drive in the future, you must bear in mind that 32K of memory expansion, and possibly a cartridge port expander, are required for the CX-5M.

In terms of price, the CX-5M is much better value for money, especially when you consider that you are purchasing a highly specified synthesizer *and* a computer.

The Toshiba system is perhaps a little too expensive as an add-on. When bought as part of Toshiba's Music Maker package, in which an HX-10 micro is included, the system offers greater value for money.

Nonetheless, the Toshiba unit is a very well presented product and worth considering if you have a fledgling interest in music. ■

Suppliers and Prices

Toshiba HX-MU901 Music System

Price: £279.99

Toshiba Music Maker Package (includes the Music System and a 64K HX-10 micro)

Price: £369.99

Toshiba (UK) Ltd.
Frimley Road, Frimley
Camberley, Surrey
GU16 5JJ

Tel: (0276) 62222

Yamaha CX-5M (includes YK-01 keyboard and YRM-102 Voicing program)

Price: £299.99

(£349.99 with full size keyboard)

Kemble-Yamaha Music (UK)
Mount Avenue
Bletchley
Milton Keynes
MK1 1JE

Tel: (0908) 71771

HANDY EXTRAS

If you're not too hot at typing, don't despair – there's plenty of alternatives to lend a helping hand


Spectravideo's Joyball may not look like a joystick, but that's just what it is!



This joystick uses a touch sensitive pad



Look, no lead — Sony's infra-red joystick

You don't need to be an expert typist to be able to use your MSX micro. By making use of the joystick ports and plugging in such devices as a mouse or tracker ball you can by-pass the keyboard altogether.

So, if you have an aversion to using the keyboard, or are a hopeless typist don't panic — we've rounded up a selection of input devices that are easy to use and can make home computing simple and fun.

You're probably already familiar with joysticks as games controllers, but did you know that they can also be used for manipulating text and graphics?

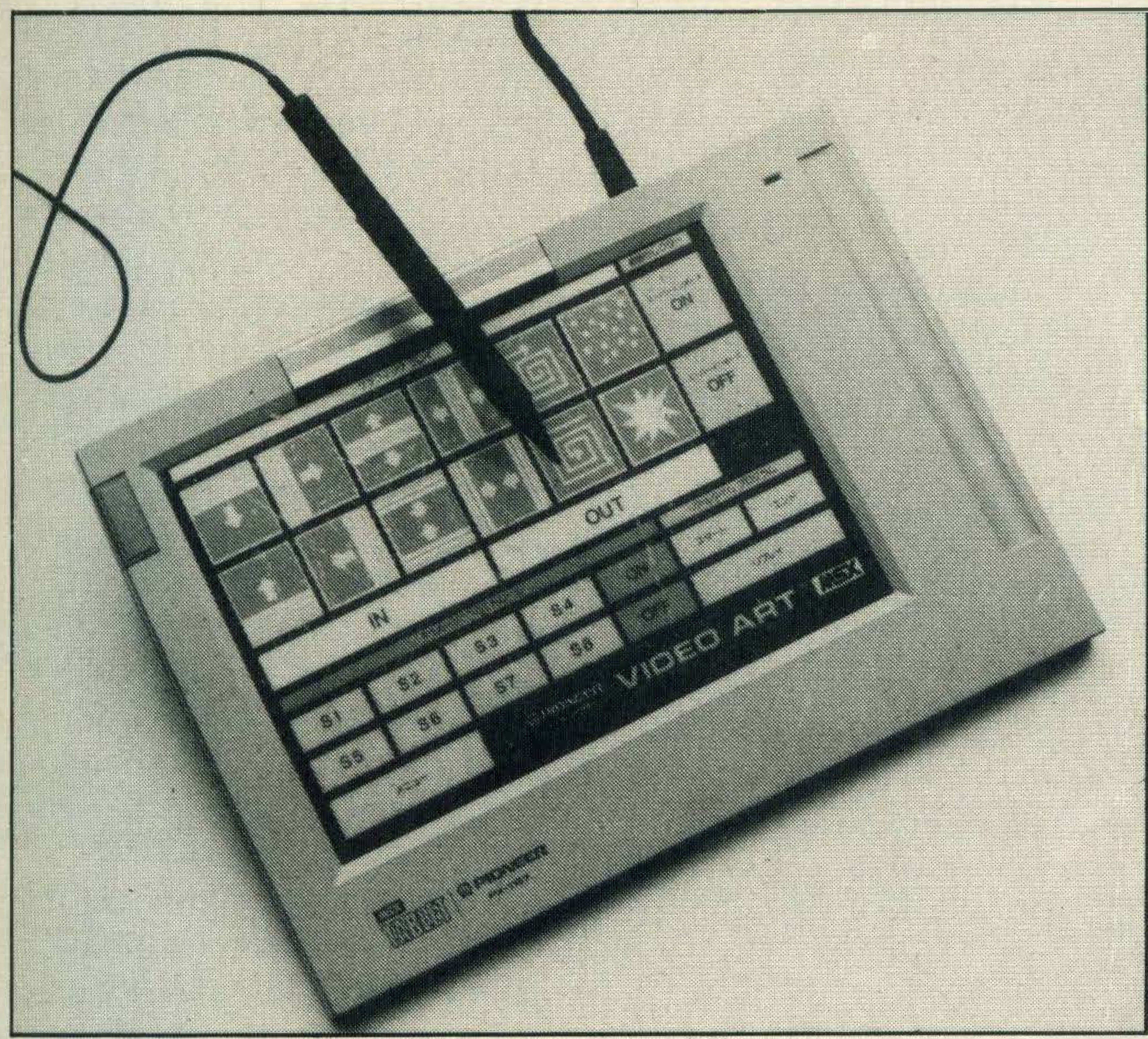
With graphics software packages such as Electric Studio's *Eddy II* and Kuma's *Colour Fantasia*, you can forget about fiddling around with the cursor control keys and have more direct control simply by moving a stick around.

Word processing can be made so much more simple too. Although you still have to input text via the 'Qwerty' keyboard, instead of fiddling with the cursor controls to move paragraphs or alter the spacing between words you just move your joystick, press one of the fire buttons and away you go.

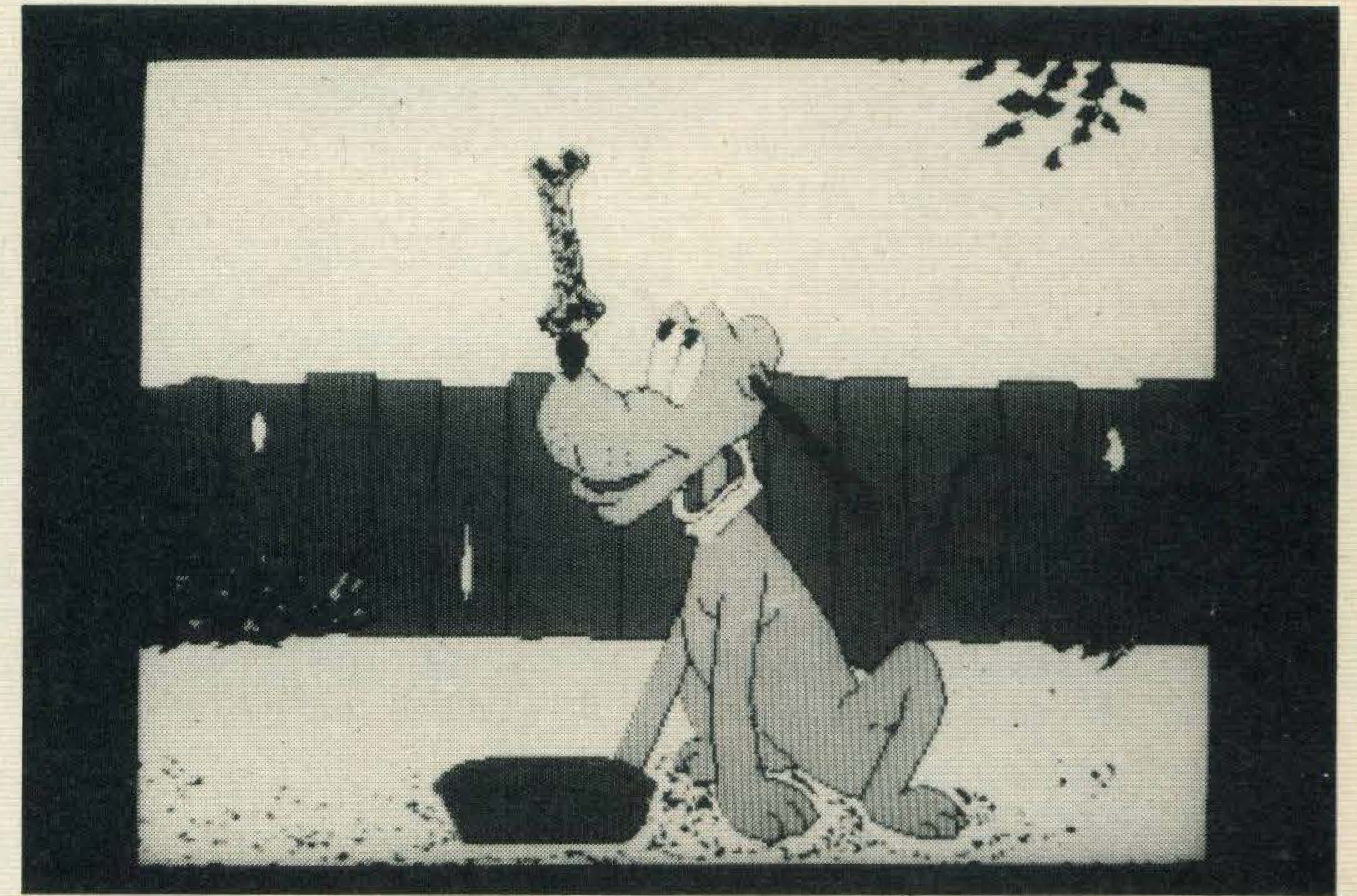
Joysticks can come in all shapes and sizes and some, like Suncom's Joy Sensor (£19.95), don't even have a 'stick' as such but a touch sensitive pad.

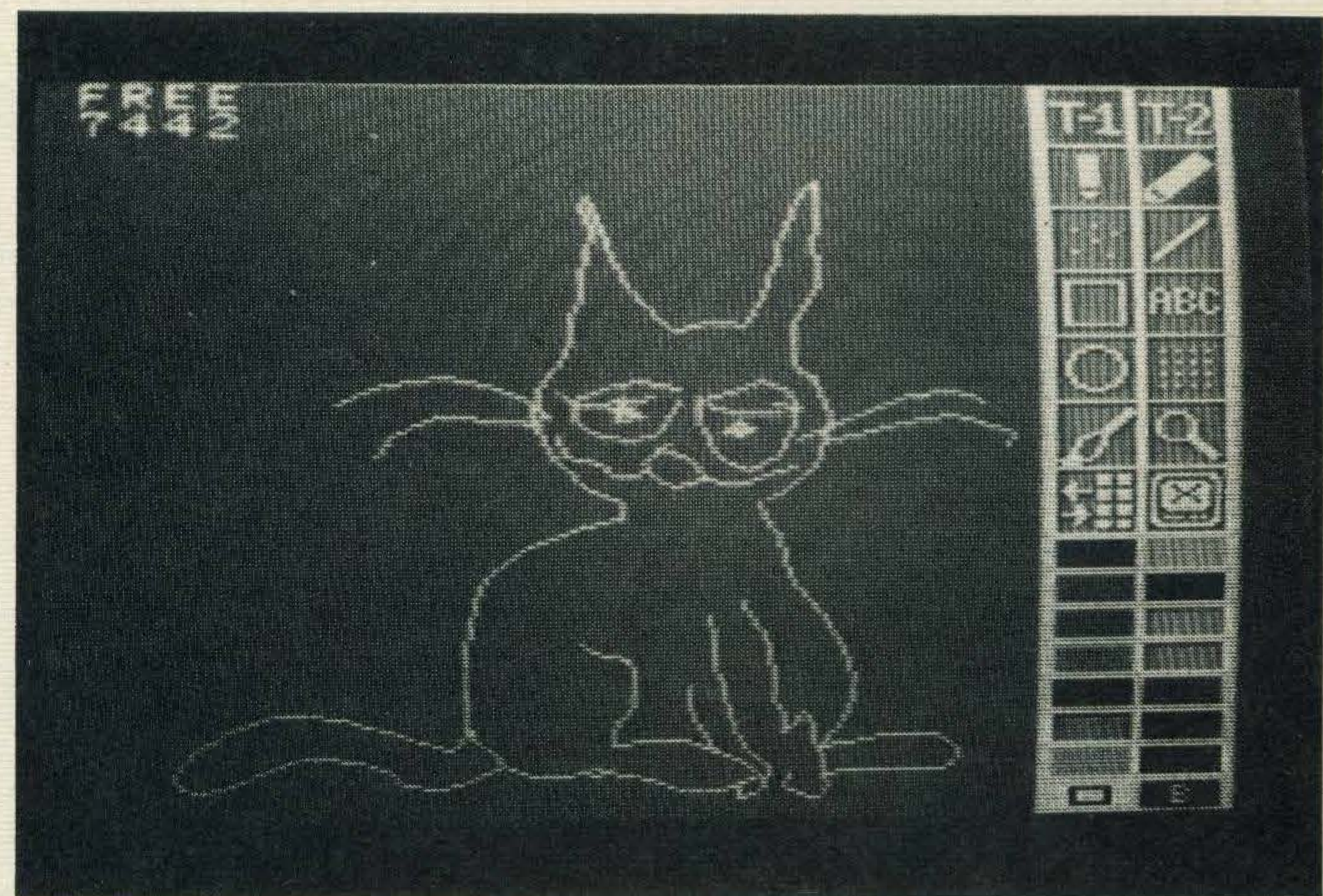
Others, like Spectravideo's Joyball which costs £19.95, have a rotating ball mounted on a square plastic casing. The beauty of this kind of device is that it offers you multi-directional movement, whereas most joysticks limit you to the eight compass points instead of 16 (which can be very frustrating).

Another type of joystick that's easy to use is Sony's

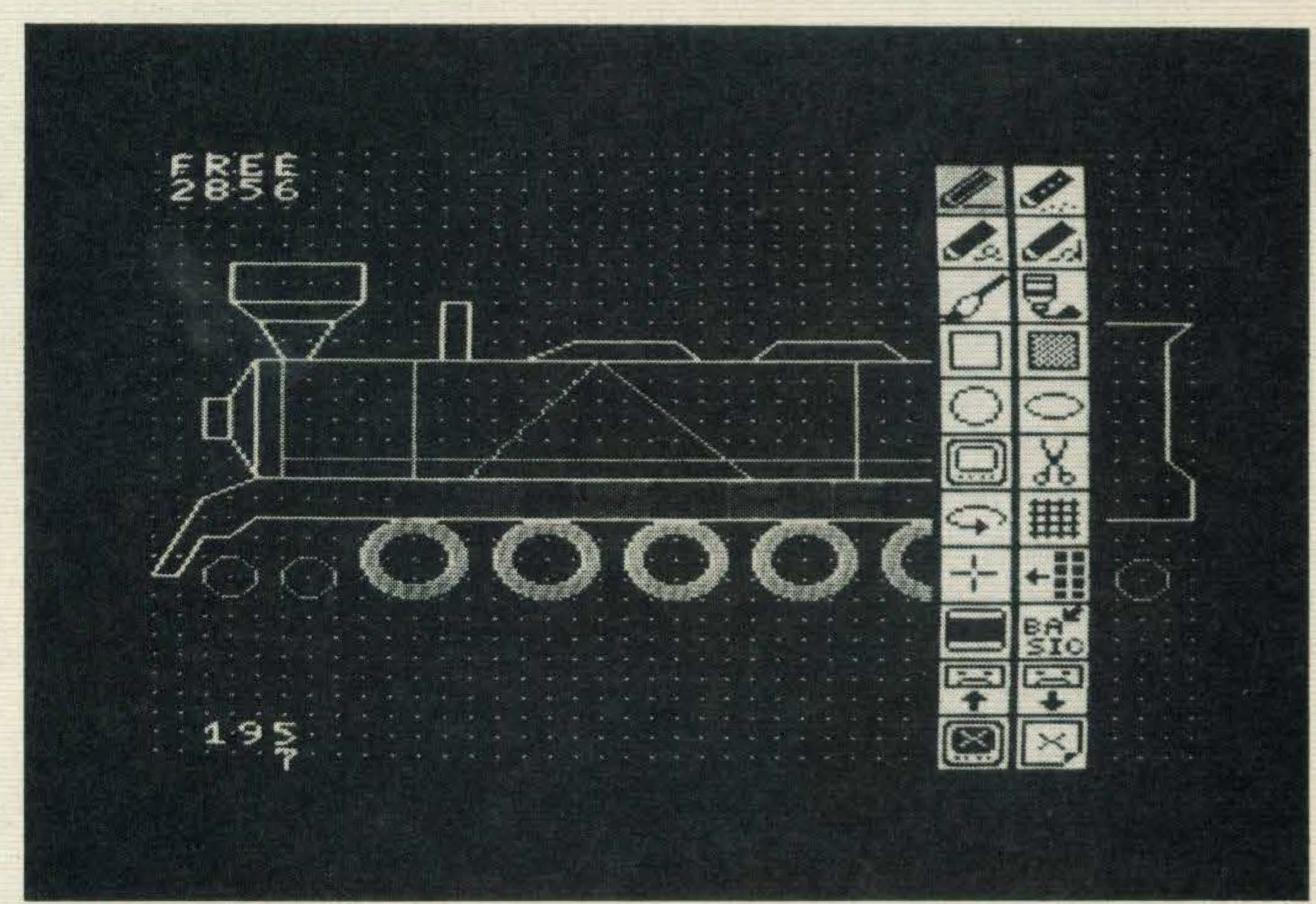


Pioneer's art tablet lets you create animated graphics


The high quality graphics possible with a tracker ball



A first effort with Sanyo's light pen



The Marconi tracker ball menu icons

JS-75 infra-red joystick controller. Although it is a bit pricey at £64.95 it means that you have complete freedom of movement, since no lead is required between the joystick and computer. Obviously it's great for playing games but it is also equally at home when used together with a word processing package or for moving sprites across the screen when designing graphics.

A more sophisticated and specialised device is a tracker ball. Marconi markets one for MSX micros. It is known as the RB2 and costs £89.95 complete with software.

It is a simple to use device that can be used for games playing as well as creating computer graphics.

All you have to do is plug the tracker ball lead into the joystick port of your computer. In a few seconds the menu appears and then, by gently rolling the ball with your fingertips, you can move the cursor over the menu and pick out which colour you want to draw in and the function you wish to use. It is as simple as that.

The software provided with the tracker ball gives you a palette of 15 colours from which to choose. You can create just about any shape you like — circles, squares, rectangles, triangles and straight lines are all possible.

By using the text mode you can use the keyboard to create characters, and the tracker ball to place them anywhere on the screen — particularly useful for technical artists who need to label their drawings.

You can magnify specific portions of a graphic design and make modifications pixel by pixel, and if you're not satisfied with the end result the 'eraser' facility will rub it all out.

The tracker ball isn't the only device with these kinds of capabilities. Wigmore House has brought out a very compact little gadget called the MS2000 mouse. The price of £78.40 includes a cassette-based graphics package called *Cheese*, or you can pay an extra £5.75 and get the software on cartridge.

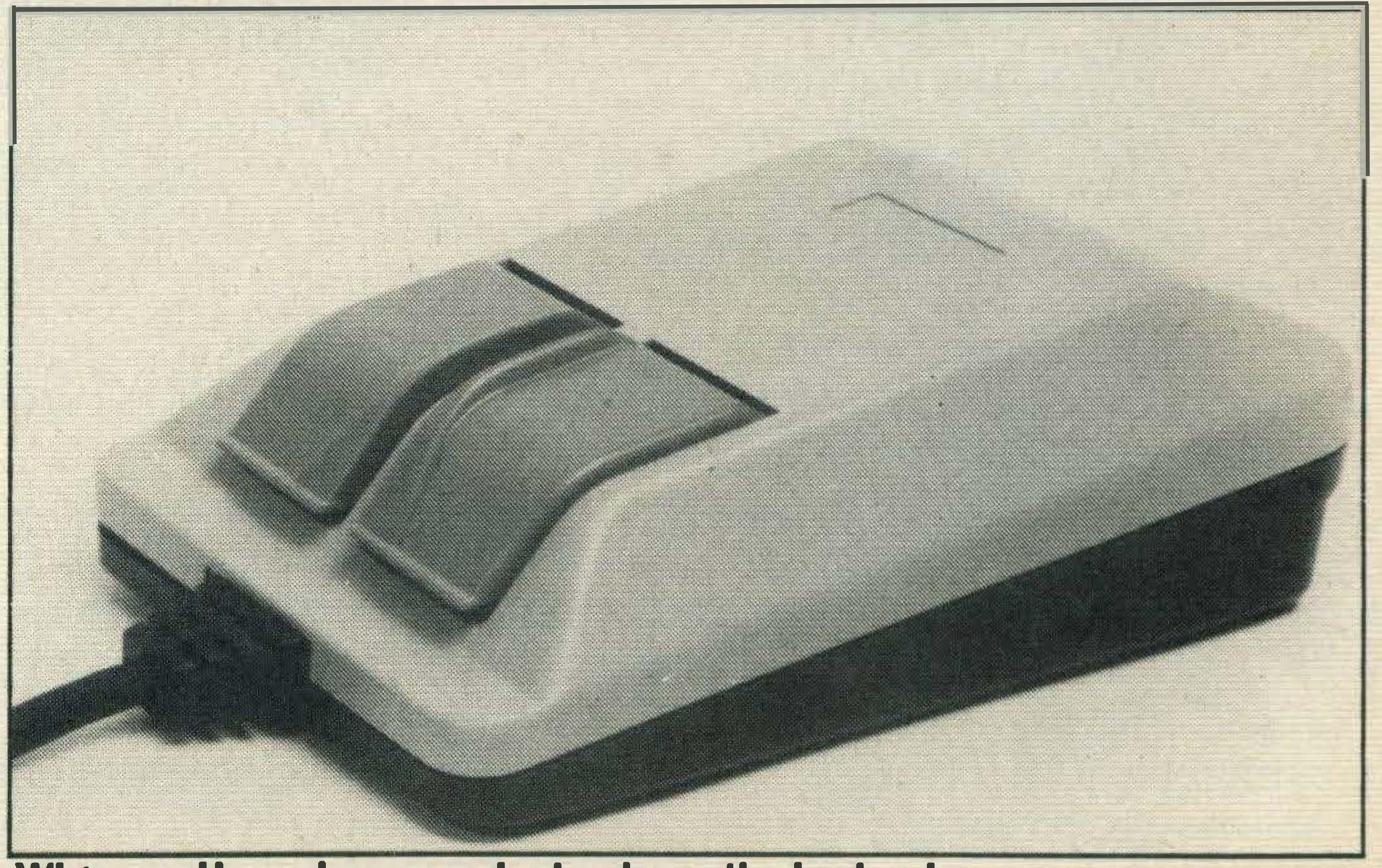
A mouse is basically an upside down version of the tracker ball, with the ball placed underneath the casing. It is operated by simply pushing the mouse around on a flat surface. A cursor, or pointer, moves in the corresponding direction on screen.

Cheese's menu is much larger than that of the tracker ball package. For starters you get not only the 15 primary colours, but an additional 120 different shades. Graphics can be scrolled up and down the screen as well as backwards and forwards.

All the usual shape commands are included — squares, circles, ellipses, rectangles and triangles, etc. And you can save all your creations to floppy disk or cassette tape.

We've not heard of any MSX owners using the mouse for




Wigmore House's mouse looks deceptively simple

word processing, as yet. However, Microsoft, creator of the MSX standard, sells a word processing package called *Word* bundled together with a mouse for the IBM PC, so maybe it won't be too long before the appropriate software appears for MSX users.

Another device which bypasses the keyboard is the lightpen from Sanyo. It costs £89.50 and comes complete with its own software. Unlike the two devices we've looked at so far, the lightpen can only be used for the input of graphics —not for text. A lightpen is very simple to use. The software is included in the cartridge interface. Just plug it in and wait for the menu to appear.

Using the lightpen is just like drawing with a large wax crayon. You create shapes and drawings simply by moving the tip of the pen around your TV screen. Like the tracker ball and mouse it has all the drawing features you'd expect of a graphics tool. There is one problem, though, which is inherent in its design.

After continued use you might develop some cramp in your hand and arm and you will probably find your arm partly obscures your field of vision.

Zoom

Having said that, the advantage of this device is that its software allows you to convert your graphics creation into BASIC and run it off as a listing. Like the tracker ball, there's an enlargement facility whereby you can zoom in on a particular section of your drawing and work on it pixel by pixel.

A similar device to Sanyo's lightpen is the Grafpad from British Micro. When our sister magazine, *MSX Computing*, reviewed it earlier this year, it cost a not inconsiderable £125. However, the company informs us that a new, improved version will be in the shops before Christmas for around £70.

In terms of design, the Grafpad is probably the most 'natural' peripheral for artists to use. It consists of a flat electronic pad covered in graph lines with an electronically sensitive pen attached. Using it is literally like putting pen to paper.

You simply draw on the pad with the pen and the design



Marconi's tracker ball was developed for air traffic control systems



Toshiba's MSX joystick has rubber feet, two fire buttons and costs £12.99



Beam stick infra-red joystick is designed to be held in the hand

appears on the screen.

It is more versatile in use than a lightpen because you are drawing on a flat surface, without having to reach up to the screen.

The only obvious drawbacks are that it cannot draw 'real' circles — we had to make do with ellipses, and you have to fill in a shape with the same colour as its border, or the colour 'bleeds' all over the screen. The problem with circles is probably due to the MSX computer, not the Grafpad.

At the time of writing, British Micro's Frank Sketch tells us that the software for the Grafpad is being re-written and that the new version will have as many features as the lightpen.

Any device that bypasses a keyboard is obviously going to be useful not only for young children (particularly the handicapped) but for anyone who cannot type.

Joysticks are cheap and underrated — they could easily be used for manipulating chunks of text in word processing or with spreadsheets. However, they're not used in this way because business users tend to associate them solely with games playing.

This doesn't apply to the tracker ball. Marconi originally developed it for the specialised field of cursor movement control on air traffic control displays. The Ministry of Defence uses tracker balls with its missile guidance systems, as they offer more direct and tactile control than a keyboard.

Verdict

Manufacturers are constantly looking out for alternative methods of inputting information into micros, in a never-ending bid to make computing more 'user-friendly' for the end user.

In the non-MSX business world there are such devices, such as the Pen Pad which is similar to the Grafpad and is solely for word processing.

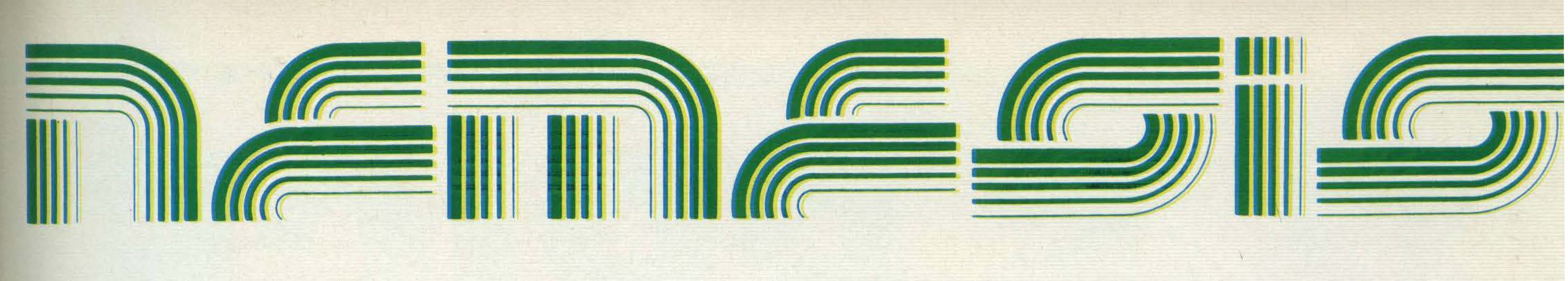
All the devices we've looked at are mainly graphics-orientated, but the tracker ball and the mouse can be used for playing games too.

The decision as to what peripheral you might need will depend on what you are going to use it for and how much you are prepared to pay.

If you are just looking for something to zap aliens with instead of juggling around with the cursor control keys then a joystick is ideal and within most people's budgets.

But if you are interested in computer graphics then you have the mouse, tracker ball, light pen and Grafpad devices to choose from.

Whichever device you decide upon, try it out at your dealer before handing over the money. Better still, take your computer with you to make absolutely sure you will know what to do with the device once you get home. ■



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THE PRICE WAR

Can Toshiba challenge Amstrad in the cheap all-in home micro market?



TOSHIBA v AMSTRAD

One of the accusations levelled against MSX by a number of critics is that the standard represents a case of 'too little, too late'. Rather than setting its sights on the latest, more flashy examples of current semi-conductor technology, Microsoft opted for a rather 'ancient' set of chips to form the backbone of its standard.

The Zilog Z80 CPU, General Instruments' sound chip, Texas' video chip and Intel's peripheral chip have been with us for some time now. They are well-proven, available in large numbers worldwide and also relatively cheap.

By combining a sensible and very flexible system design with a powerful and elegant BASIC language, Microsoft provided some of the world's greatest consumer electronics manufacturers with a true consumer-orientated computer. Finally, you had no need to be a decided computer buff to appreciate using MSX.

Unusually, it was not only the MSX consumer giants who saw the advantages of using established technology. The UK's own popular electronics company, Amstrad, finally entered the micro market with a system using no less than three of the four chips found in MSX computers.

Electronics impressario Alan Sugar, head of Amstrad, moved into computers after a towering success in hi-fi systems. Being a shrewd and successful man, he waited until the market was right and stepped in with customary gusto. The timing was to prove almost perfect.

With no less than four different computer systems (one of them a full-blown word processing micro) to its credit in a remarkably short period of time, Amstrad's watchword of value for money has captured the imagination of the computer buying public.

Given that the hardware specification of both the first Amstrad computer, the CPC464, and MSX is very close, it is worth comparing the two systems in some detail to point out the major differences.

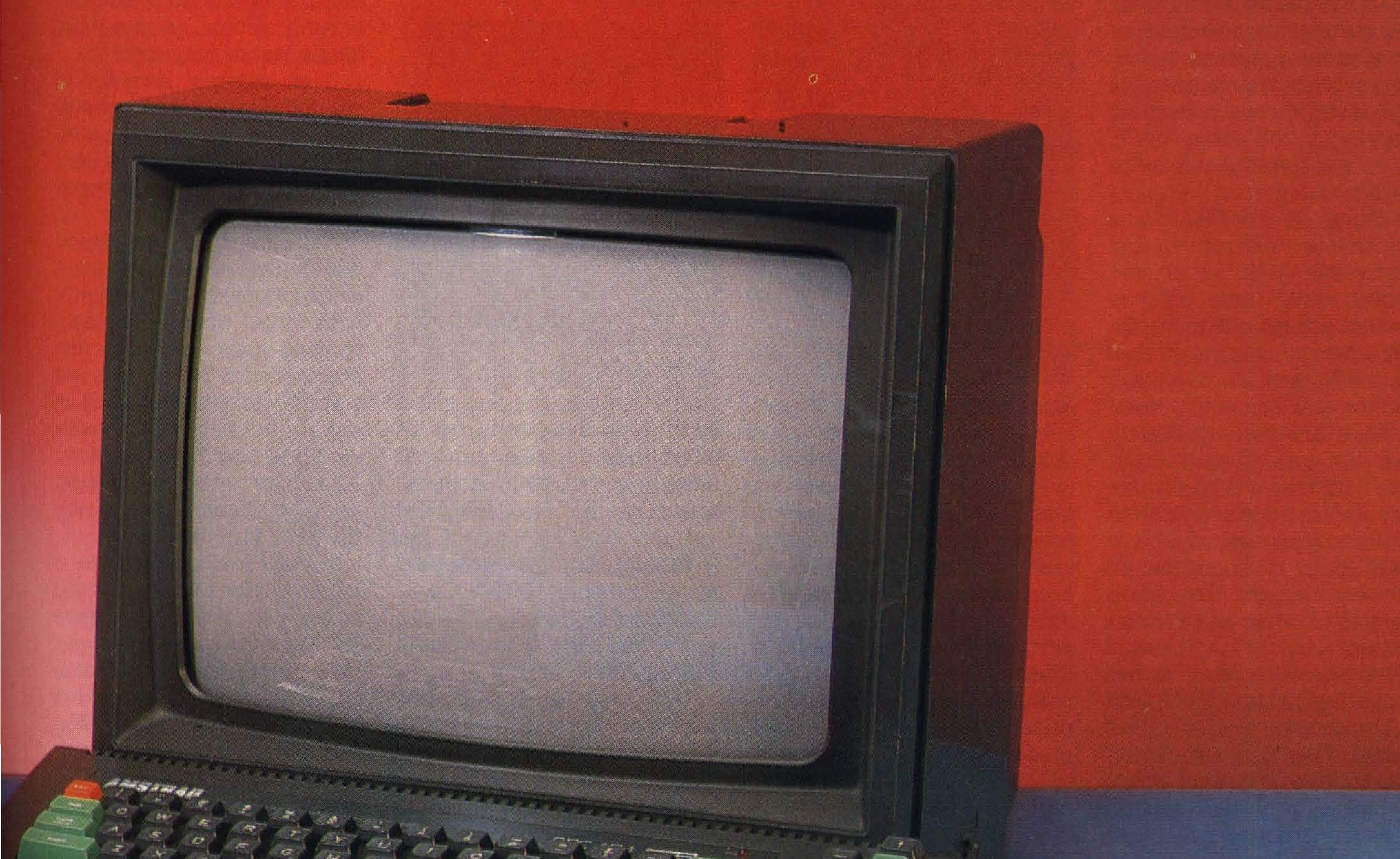
As the Amstrad CPC464 computer comes complete with a monitor and cassette recorder, we have assembled an equivalent set of MSX units for the comparison.

Toshiba has subjected its HX-10 micro to some pretty aggressive price-cutting over the last year. From a launch price of £279.99, the HX-10 has now dropped to an all-time low of £79.99 — or even less if you are prepared to shop around.

Not content with this bargain, Toshiba recently announced the availability of a starter kit which we examine here. For the moderate sum of £99.99 you can get: an HX-10 micro, HX-C810 data recorder, three games, a five program demo tape, three manuals, two plugs (British made! — one for the cassette, the other for the micro) and to top it all, a screwdriver to get the lot plumbed into the National Grid.

This sort of pricing policy is bound to send shivers coursing up and down even 'Uncle' Clive Sinclair's back.

To complement the starter kit, we have chosen a standard



14 inch colour TV set, the Toshiba 140E4B, which costs around £189.99. This makes the total cost of our example MSX system £289.98 or less.

Amstrad

The Amstrad system comes complete with a colour monitor, built-in data recorder, a single manual and 10 software packages. This little lot will cost you in the order of £299.99. The same computer is available with a 'green screen' monitor for some £100 less.

The CPC464 adopts the typical Amstrad 'one plug' approach. In its earlier hi-fi systems, the company realised that most purchasers disliked the 'heap of spaghetti' that was found lurking behind most audio systems. Computer owners may also have noticed that their systems attracts more wiring than there is pasta in Venice.

By cutting out the number of connections required in a computer system, the cheaper it is to produce, but perhaps more importantly, the easier it is to get to grips with if you are a beginner.

Setting up the CPC464 is very simple. First you need to attach the CPU box to the monitor unit. There are two connections required: one for a 5V power supply, the other is the video link between the monitor and computer. Next, you have to take the mains plug (yes, the *only* mains plug!), push it into the wall, switch on the computer and your system is fully operational.

It is *so* easy to set up that an onlooker thought that some vital pieces of wiring had been omitted!

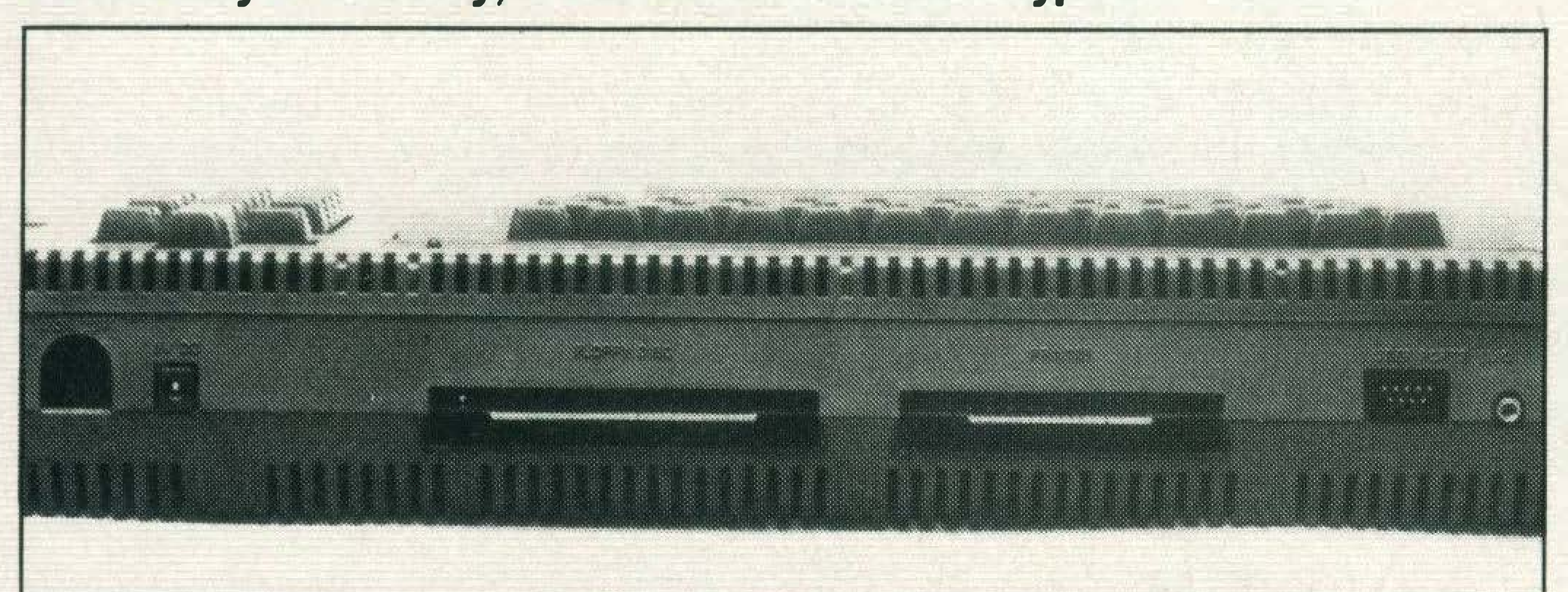
The hardware itself is not staggeringly attractive to look at. The monitor and computer casing of the CPC-464 are an almost military shade of green. The initial overall impression is the size of the system. If you go to buy one, take a car or a friend with a packhorse. Much of the bulk may be attributed to the monitor unit.

The computer unit itself is a slim affair, with the data recorder built-in on the right hand side. It makes you wonder how they manage to pack all the electronics into such a relatively small space.

The answer is simple: the power supply is housed in the monitor casing. Transformers are in themselves quite large objects, and the whole supply unit needs room to allow heat dissipation. By separating power unit and computer, you are far less likely to run into overheating problems encountered when the micro is left switched on for long periods of time.



The Amstrad CPC464 keyboard is quite slim and carries an extra large ENTER Key. Unusually, it includes a numeric keypad



The expansion facilities could be better — note the low cost edge connectors, exposed to dust and possible damage

> ***Amstrad CPC464 — 64K RAM***
>
> **Package Includes:**
>
> **Built-in data recorder**
> **Colour monitor**
> **12 pack of software**
> **1 diagnostic tape**
>
> **Price: £299.99**
>
> **Supplier:**
> **Amstrad, P.O. Box 462, Brentwood, Essex, CM14 4EF**



The built-in 'datacorder'

The micro's keyboard comprises the standard alphanumeric and control keys, a set of cursor control keys and, unusually for a micro in this price range, a numeric keypad. The keyboard is adequate for typing purposes, though it generally feels cheap. An extra large RETURN key is a most definite plus, particularly if you are one of the legion 'hunt and peck' typists.

The data recorder is a fairly straightforward affair. All the standard play, record, rewind, etc. functions you would expect are present, as well as a program tape-counter. Being 'hardwired' into the rest of the system, it is likely to be far more reliable than cassette units linked rather precariously with the usual MIC/EAR/REM set-up.

The cassette can save data at two speeds: 1000 baud — the 'safe' option, and at the superfast, but less reliable 2000 baud.

The only other features worthy of note on this unit are a power switch and a volume control. The volume control alters the output level of the system's internal speaker.

Peripheral expansion on the system is a major sore point. Rather than using standard connectors, Amstrad has adopted the low cost 'clip on the PCB' type connections. Although the printer port obeys the Centronics standard, you may well find that you will have to purchase a specially adapted cable. The same is true of the joystick ports.

The system software, incorporating a dialect of BASIC, occupies 32K of ROM. This is a very powerful, reasonably fast language. Boasting a fine spread of commands and functions, this BASIC, although very close to Microsoft BASIC, is often far superior.

Graphics are very good on this micro. The top screen resolution offers 640x200 pixels, although only two colours may be shown at once in this mode. 80 column text can be displayed, opening up the system to CP/M users (with disk drive, of course). In other graphics modes, a maximum of 16 colours from a palette of 27 may be used.

The sound capabilities of the system are identical to those found in MSX computers. This is hardly surprising as both types of computer use the same sound chip. The means of accessing the chip through BASIC is far too cumbersome, and there is no language construct quite as friendly for playing tunes as the MSX Music Macro Language.

If an external amplifier is used, the sound produced may be split into stereo, with each of the voices occupying left, right and centre of the stereo field.

Software supplied is of good quality, and even includes a word processor. The value of the added software is estimated at over £100 by Amstrad. In the main these are commercial packages riding under the flag of Amstrad's software arm, Amsoft. *Harrier Attack* from Durrell Software and *Oh Mummy* are possibly the most familiar titles.

A fault-finding cassette is also included, so allowing you to run periodic checks on the health of your system.

A major disappointment is the manual supplied. This is badly laid out and quite patchy. The style in which it is written can be very irritating. You can get a more detailed manual at a not inconsiderable price from Amstrad. Alternatively, you could opt for an independent book dedicated to the system.

As for future expansion, joysticks, printers, speech synthesizers and an incredibly cheap 3 inch disk drive are just a few of the options currently available.

Software houses are rapidly converting titles for the CPC464. *Manic Miner* is one famous title that has under-

taken the migration. Hi-Soft's range of software development tools ('C', Pascal, Assemblers etc) have already been converted in both cassette and disk formats.

Overall, the Amstrad CPC464 is a superbly specified micro, with a healthy future ahead of it. Most of the peripherals you will be likely to need can be supplied by either Amstrad or a third party manufacturer. Software support is flooding in, with a wide range of both games and business software. The quality of this software is generally very good too.

There has, though, been a great deal of cost saving in the design: the edge connectors and the overall 'tacky' appearance of the system are dead giveaways.

Toshiba

After this brief look at the Amstrad, how does the Toshiba system compare?

With the supplied plugs and screwdriver, you are able to wire up your system straight away. You will then need to connect the monitor and cassette unit before you can begin to play.

The micro is no stunner to look at, but is very well constructed. The QWERTY keyboard lacks a numeric keypad, and has a rather 'slack' feel about it. Not exactly a touch typist's dream. Toshiba aimed this system squarely at the micro enthusiast. With the bright colour scheme, it looks very much the part of a games micro.

At the back of the computer are standard TV, monitor and cassette connectors and a covered expansion bus. The side of the computer houses two 'D' type I/O sockets for joysticks and the Centronics printer port.

The cassette unit supplied with the HX-10 is a rather tasty looking (as such things go) jet black model. It has a program tape counter, Automatic Level Control for recording purposes (this can be switched out if desired), a monitor feature and a condensor microphone.

The Automatic Level Control sets a consistant recording level. This saves you worrying about the volume setting each time you save or load programs.

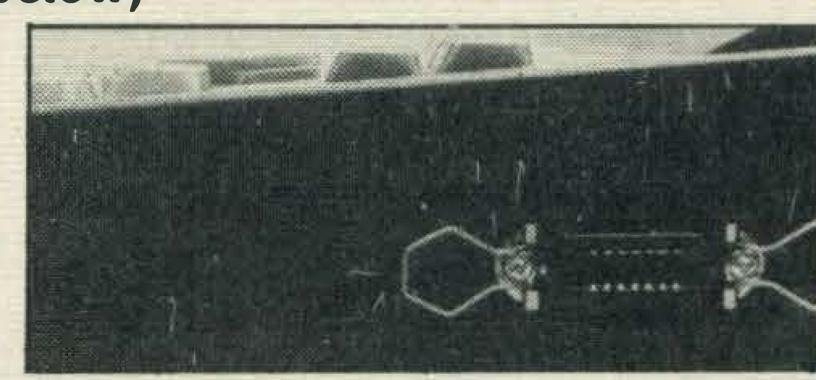
MSX micros can save data at two speeds: 1200 and 2400 baud. As with the Amstrad, the slower speed is preferable as it is less error prone.



The Toshiba HX-10 — no stunner, but sturdy and reliable



Both video and TV outputs are provided. Note the protected expansion bus (above) and two joystick ports (below)




Toshiba's stylish data recorder

> ***Toshiba Starter Kit***
>
> **Package Includes:**
>
> **Toshiba HX-10 64K computer**
> **HX-C810 Data Recorder**
> **3 games cassettes**
> **1 demo cassette**
> **1 blank tape**
> **2 mains plugs**
> **1 screwdriver**
>
> **Price: £99.99**
>
> **Toshiba 140E4B 14inch TV**
>
> **Price: £189.99**
>
> **Typical MSX System**
> **Price: £289.98**
>
> **Supplier:**
>
> **Toshiba (UK) Ltd.,**
> **Toshiba House, Frimley Road,**
> **Frimley, Camberley, Surrey.**

Our chosen 'monitor' was one of Toshiba's 14 inch colour TV sets. This gave excellent results, with much less of the screen 'clipping' than might be expected of an ordinary TV. And you can watch *Dallas* on this set, too!

MSX-BASIC is a fine language, but it is awfully greedy for memory. 28K is left for your programs out of an original 64K. And that is before you've even *thought* about programming. The CPC464 is much kinder, leaving you around 42K free to fiddle with.

Although the Amstrad offers higher graphics resolutions, it does not offer sprites. With MSX you may define up to 256 sprite patterns, and place up to 32 on screen at once.

As well as the usual LINE, CIRCLE and PAINT types of commands, MSX-BASIC offers a simple sub-language to produce graphics. The Graphics Macro Language consists of strings of instructions. For example, 'U40' means 'move up 40 units'. Shapes may be scaled up or down or even rotated.

A similar language for the manipulation of music exists. Instead of specifying frequencies for the sound chip as you have to in Amstrad's BASIC, you specify notes on the musical scale, e.g. 'CAB'. Rests, dotted notes, tempo and note length are a few of the parameters that may be altered.

There are three manuals supplied. One is a very elementary beginner's guide, the second is a reference to the MSX commands.

The third manual is entitled *Getting the Best from Your MSX*. This is quite an expensively produced booklet giving a very broad overview of the applications of computers and a good many programming examples as well.

Tosh, the character from the Toshiba commercials, finally makes an appearance. There is even a program detailing how to draw Tosh's wire frame head.

Everything from graphics to communications is touched upon. This is quite an unusual booklet, and it will probably work quite well.

Software supplied by Toshiba has been specially commissioned for the HX-10. Two of these are games and one is a tutor program. There is also a set of five demonstration programs in the starter kit.

MSX owners are beginning to see substantial amounts of software available after what was a painfully slow start. Like the Amstrad, conversions are filtering across from the more established micros such as the Commodore 64 and Spectrum.

Conclusion

The Amstrad CPC464 initially sold very well because it was cheap when compared to competitive systems. When viewed in the light of the recent price cuts in the MSX marketplace, it looks like the Amstrad system may lose some of its advantage.

On a technical level, the systems are fairly evenly matched. The Amstrad scores higher on the quantity and quality of its packaged software.

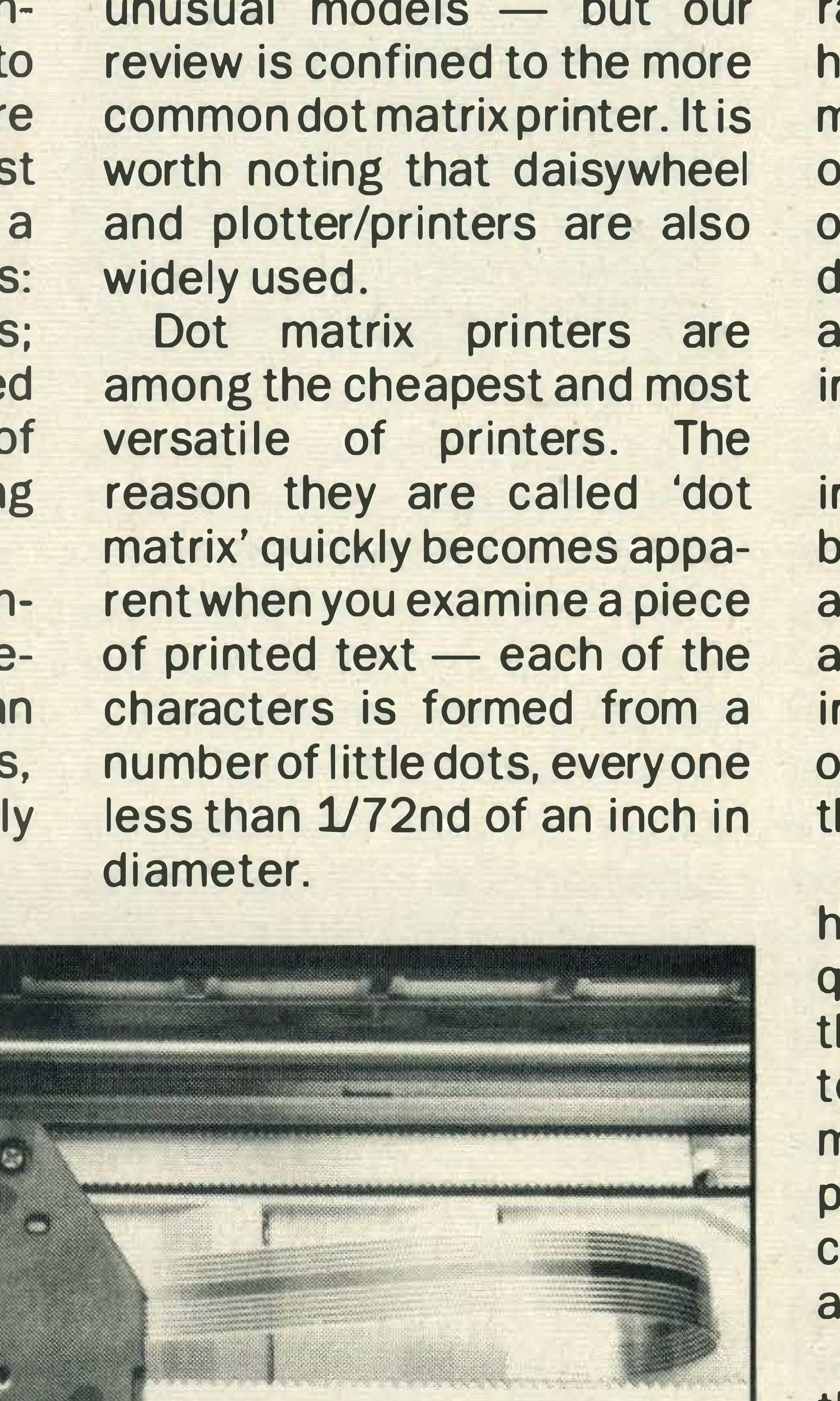
On the other hand, users of the Toshiba system can take advantage of other MSX manufacturer's peripherals; Amstrad owners may have to wait for Amstrad, or third party suppliers.

Bear in mind that a cheaper colour TV set than the Toshiba model we've recommended could be purchased, so bringing the system price down still further. Any colour TV with an aerial socket is suitable for MSX micros — most people will already have one at home.

But a few months ago, the Amstrad system would have won hands down when compared on a price/performance level with other home micros, including those of the MSX stable.

The new price cuts from Toshiba are certain to endanger Amstrad's dominance of the cheap, high-performance micro-computer market. ■

DOT TO DOT



Do you need a versatile, cheap, fast printer? We outline three of the latest models

Once you've taken the plunge and bought a computer, the chances are that within months you'll think about buying a printer— for the majority of serious applications, including programming and business, keeping records of your work is essential.

But steel yourself for a shock —a printer can cost more, a lot more in fact, than the computer itself! It seems ridiculous, but if you think about it a printer is made up of many more moving mechanical parts than a micro.

As with any expensive electronic item, you need to consider what task you intend to use the printer for before handing over the cheque. Most people use their printers for a combination of applications: listing computer programs; printing out word processed text; keeping hard copies of data and for reproducing graphics such as pie charts.

All three of our review printers, the Epson GX-80, Riteman F+ and Star STX-80 can cope with those applications, but they are not necessarily ideal for all of them.

Printer mechanisms are a varied breed — helical ridged-drum and electro-sensitive printers are some of the more unusual models — but our review is confined to the more common dot matrix printer. It is worth noting that daisywheel and plotter/printers are also widely used.

Dot matrix printers are among the cheapest and most versatile of printers. The reason they are called 'dot matrix' quickly becomes apparent when you examine a piece of printed text — each of the characters is formed from a number of little dots, every one less than 1/72nd of an inch in diameter.

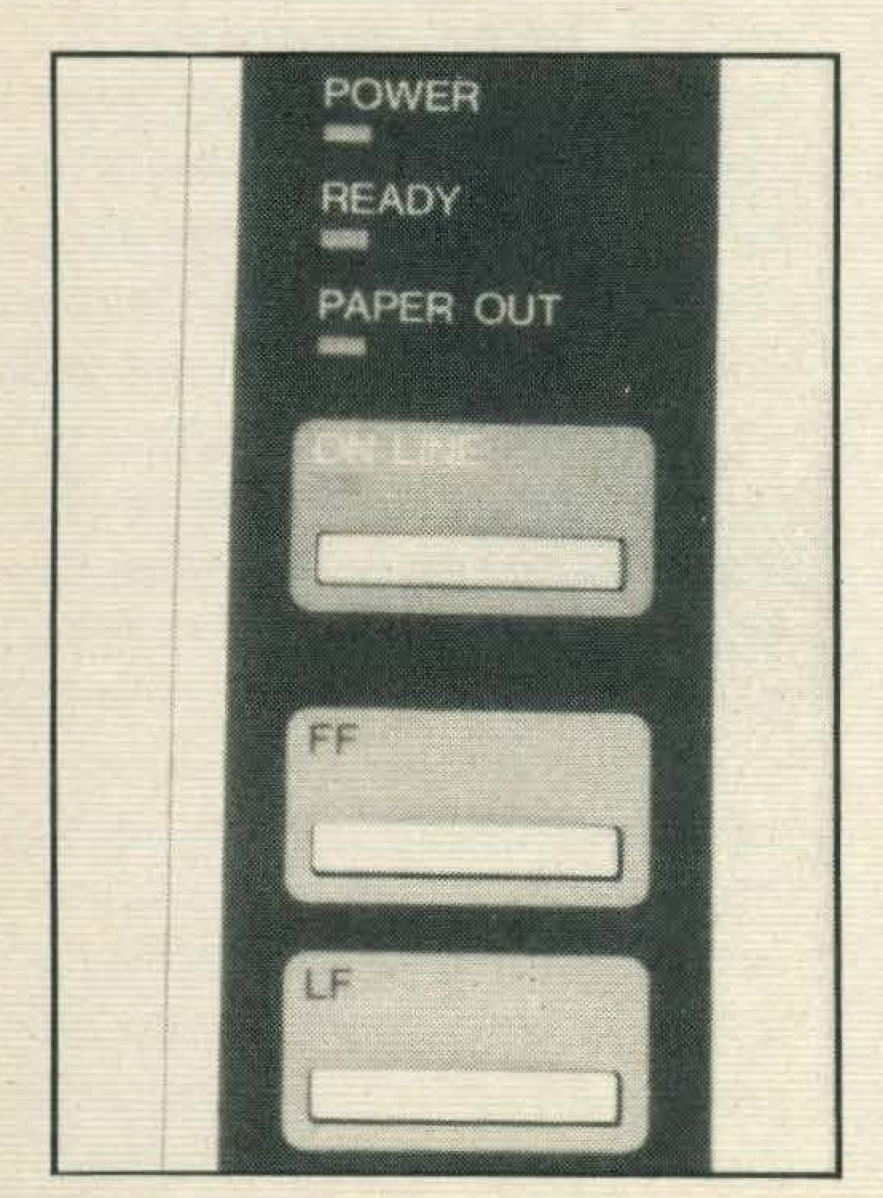
The print head, the mechanism which strikes the paper, consists of a number of wires or pins mounted on a base — rather like a flattened hedgehog — forming the character matrix. These pins are pushed out of their resting position onto the paper to make the dots, a bit like shooting a gun, and commonly known as making the pin 'fire'.

As each pin is fired it hits the inky ribbon to mark the paper behind. Thermal printers, such as Star's STX-80, use heat and a special type of paper containing ink and don't need ribbons or impact to form characters— they are much quieter.

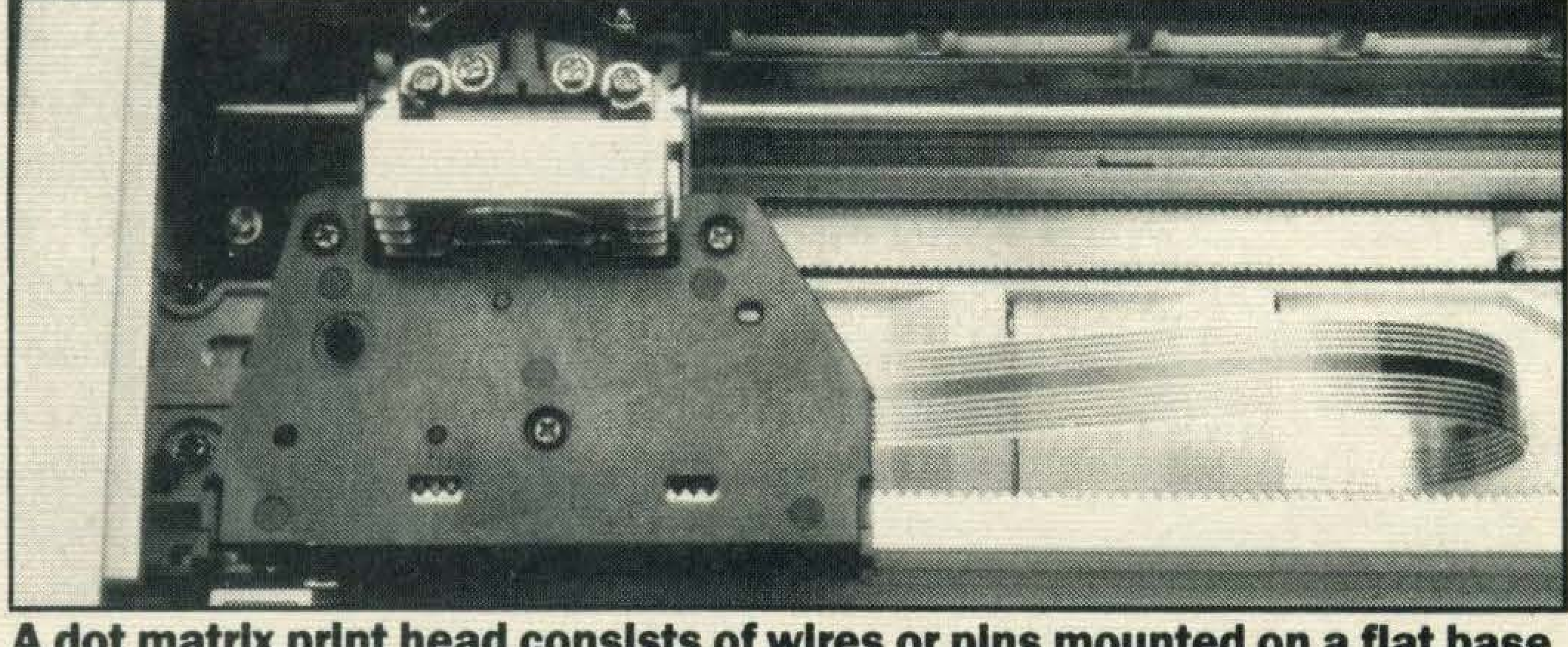
The more pins on the printhead, the better the print quality, which in turn affects the price. The average character matrix is about 7×9 which means a printhead with seven pins which moves across nine columns to create each character.

Both the Epson GX-80 and the Riteman F+ printers offer 'dual mode' printing. They use a 9×9 pin matrix for fast, draft quality print, and a 9×11 matrix for higher quality but slower output. The draft quality is perfectly adequate for memos, essays, business and personal correspondence.

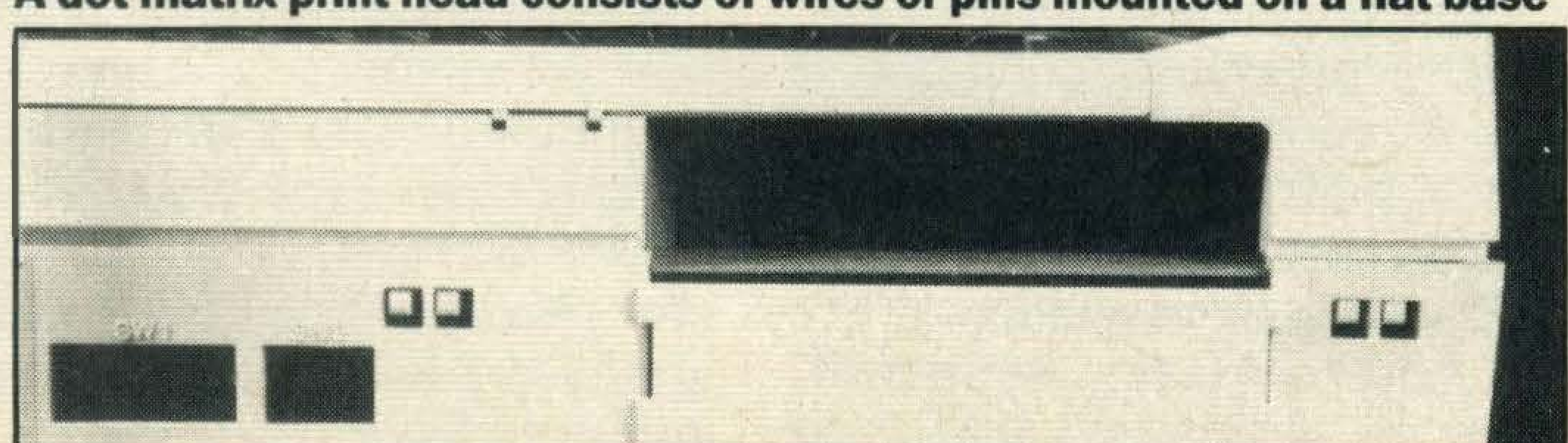
The higher quality, 9×11 matrix (known as NLQ, or near



This printer control panel combines lights and buttons



A dot matrix print head consists of wires or pins mounted on a flat base



The socket for the Epson GX-80's parallel printer interface cable

letter quality) output is suitable for more formal letters and reports, and means that you don't have to pay for an expensive daisywheel printer for producing letters and formal reports.

While in NLQ mode, the Epson GX-80's print head slows down enabling the dots to overlap horizontally and produce the 9×11 matrix of dots. The resulting letters are much more fully formed.

The Star STX-80's print head, on the other hand, has a 5×9matrix, so the print quality is not quite as good as the other two — but it does cost £100 less. This printer has no dual mode facility.

These printers are especially useful for programmers, because a wide variety of characters — scientific characters, symbols and letters used in foreign languages, various typestyles and a good range of dot and block graphics — can be produced.

With those features to their credit, dot matrix printers, especially the dual mode printers, will support so many applications that they are especially suitable for most MSX users.

Daisywheel printers produce very high quality print and are ideal for printing large amounts of word processing, but they're slow and are limited to those characters on the print element. Printer/plotters use biro-type pens to draw diagrams and characters — great for listings and diagrams, but not for word processing.

Dot matrix printers combine the features of those printers and are nearly always less expensive. Dot matrix printers do vary in price, but our experience shows that you usually get what you pay for.

Features influencing the cost include overall quality of engineering, size of character matrix, the range of character sets, printing speed, operating noise (they can be deafening!) and the print formatting commands available.

Paper feed mechanisms are an important element to consider when choosing a printer. Both the Epson GX-80 and Riteman F+ will handle single sheets and continuous tractor feed paper, both of which are suitable for the majority of applications.

Thermal (heat sensitive) paper for the Star STX-80 comes on a roll and isn't suitable for uses where cut sheets are essential.

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]^_`abcdefghijklmn●
pqrstuvwxyz{|}~
```

A test print out using the Star STX-80's American International character set

Draft pica	Underlined
Elite	Superscript
Near letter quality	Subscript
Emphasized	NLQ/Emphasized
Double-Strike	Double-Strike/Condensed
Enlarged	Double-Strike/elite
Condensed	Double-Strike/condensed/elite
Italics	Condensed/elite

Both the Epson GX-80 and Riteman F+ include a variety of typestyles

Star STX-80

Of the three printers, the Star STX-80, a thermal dot matrix printer, is the cheapest at £183.

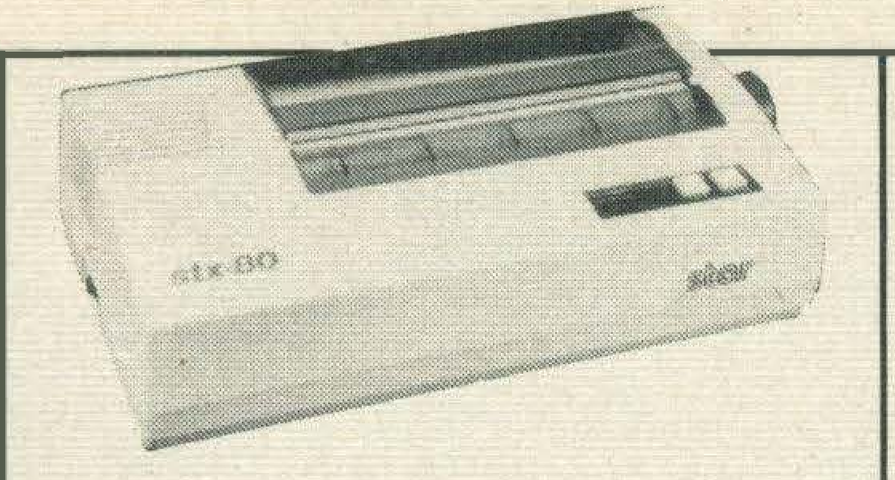
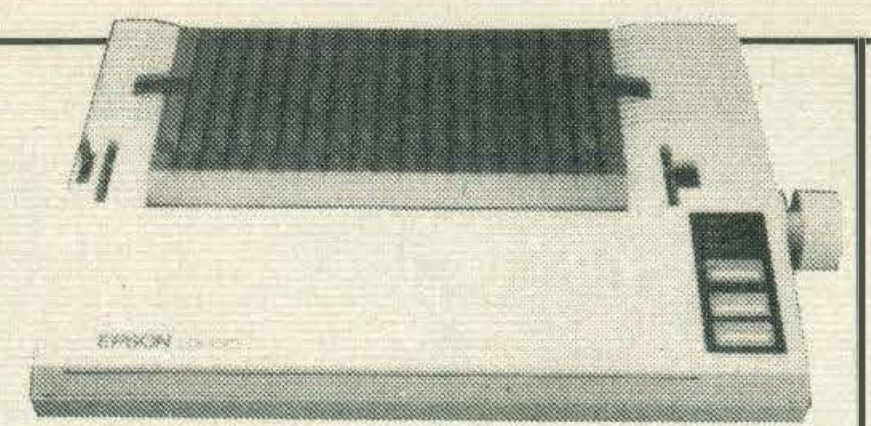
In appearance it is a sturdy-looking, compact machine, styled in white with a greyish smoked Perspex lid. A little control panel sits on top of the printer and using a combination of two lights and buttons the paper can be wound on for the full length of a page (form feed) or just for a line at a time (line feed).

A space at the back of the printer holds the roll of thermal paper. Because the paper is contained within the model, very little desk space is taken up.

Thermal paper is not stocked by all dealers, but Star advises us that it can easily be ordered. It is much cheaper than other types of paper; for instance Star's own brand costs £4.80 for a 30 metre roll.

Getting the printer up and working is a cinch. The manual, written in a lighthearted, readable style, clearly explains even the most difficult printing concepts (although it is aimed at Commodore 64 owners) and we were soon ready to print, with our DIP switches set and the paper loaded.



			
MODEL NUMBER	**STAR STX-80**	**EPSON GX-80**	**RITEMAN F+**
TYPE	Thermal dot matrix	Impact dot matrix	Impact dot matrix
PRINT SPEED	60 cps	100cps	105 cps
CHARACTER MATRIX	5 × 9 dots	9 × 9 dots	9 × 9 dots
MAX COLUMNS	80	80	80
PAPER WIDTH	8.5 inches	10 inches	10 inches
PAPER FEED	Friction	Friction, optional tractor feed	Friction
DIMENSIONS	100 × 352 × 190mm H × W × D	84 × 421 × 314mm H × W × D	95 × 385 × 265mm H × W × D
PRICE	£183	£344	£310
DISTRIBUTOR	Star Micronics, Craven House, 40 Uxbridge Road, London W5 2BS Tel: 01-840 1800	Epson (UK) Ltd, Dorland House, 388 High Road, Wembley, London HA9 6UH Tel: 01-902 8892	C. Itoh Electronics, Beacon House, 26-28 Worple Road, Wimbledon, London SW19 4EE Tel: 01-946 4960

N.B These specifications are taken from the printers' draft quality print modes and don't take the specialised typestyles into account. The quoted prices include VAT and, in the case of the Epson GX-80, incorporates the parallel interface cable cost.

Setting DIP switches is just one of three methods used to control printers. You can also send control signals directly to the computer using signals defined in the interface, or send data sequences which are interpreted by the printer as a control code or sequence of codes. It may sound complicated, but a good book will soon enlighten you.

The printing speed is not fast, at 60 characters per second (cps), but it is quiet. A maximum paper width of 8.5 inches is taken by the printer so it can cope with 80 column text . . . just.

Printing out graphics seems to be the STX-80's *forte*. Both block and dot graphics can be accommodated enabling users to define a number of characters not included in the printer's character set. It copes with word processing, but there is no NLQ mode and only pica and emphasised typestyles are available.

Star's STX-80 does have its limitations, but it's a bargain for anyone who wants to print listings, design graphics or write the odd letter.

GX-80

Epson is the leader in printer design and for many rivals, Epson's printers are a base from which to make their own machines.

The GX-80 is the latest addition to its stable, and it just oozes with features, varied enough to make printing a real pleasure.

At £286 it is competitively priced, but MSX users will need to get the parallel interface cartridge, bumping the price up to £344.

By far the biggest and most stylish of the printers, it is a cream colour with smoked Perspex paper separator on top. Even the control panel with its attractive blue, black and grey colouring enhances the appearance.

There is a ribbon to be fitted in this model, but we had no problems — just a hint of ink on our fingers. Fitting the paper was simple, although we didn't have the optional tractor feed, costing £20, to try out.

The quality of the Epson GX-80's draft mode is excellent, due to the dense 9×9 character matrix, and the NLQ mode looked almost identical to typewriter print.

Numerous print modes are also available to vary and enhance printing — pica, elite, emphasised, double-strike, enlarged, condensed, italics, underline, super and sub script — and these can be combined to produce characters in NLQ/emphasised or even double-strike/condensed/elite (see figure 2).

Selecting these typestyles is so easy with Epson's 'Selectype' system. By pushing a number of the control panel buttons, it is possible to move into and out of any of the print modes — now that's what we call user friendly.

At 100cps in draft mode, it's fairly fast, but is also extremely noisy — a problem in an open office, but for most domestic purposes just an inconvenience.

Apart from the wide variety of text characters, including a number of international character sets — Swedish and French for example, the GX-80 can deal with user-defined characters as well as dot graphics.

The excellent Epson manual is comprehensive and provides a summary at the back for easy reference.

Once again, Epson has produced a top class printer with all the features you could possibly want for the price.

Riteman F+

Characterised by a rather unusual design, the Riteman F+ shares many features with the Epson GX-80, but costs less. For £310, it incorporates a parallel interface and a tractor feed.

Like the other two models, it is creamy in colour and has a smoked Persex lid, but that's where the design similarities end. The main printer mechanism is situated at the front and paper is fed in from underneath to the front. Two special wire feet raise it seven centimetres from the ground, leaving enough space to store a box of paper underneath — a useful feature if space is limited.

The Riteman F+ takes both cut sheets and tractor feed paper — no need to buy extra attachments — and will cope with 80 columns of print.

The print modes cover the same range as the Epson GX-80, although there is no Selectype function. Print speed is slightly faster, 105 cps compared to the GX-80's 100 cps, and again it is very noisy. Print quality is good and we found no discernible difference between its output and that of the Epson.

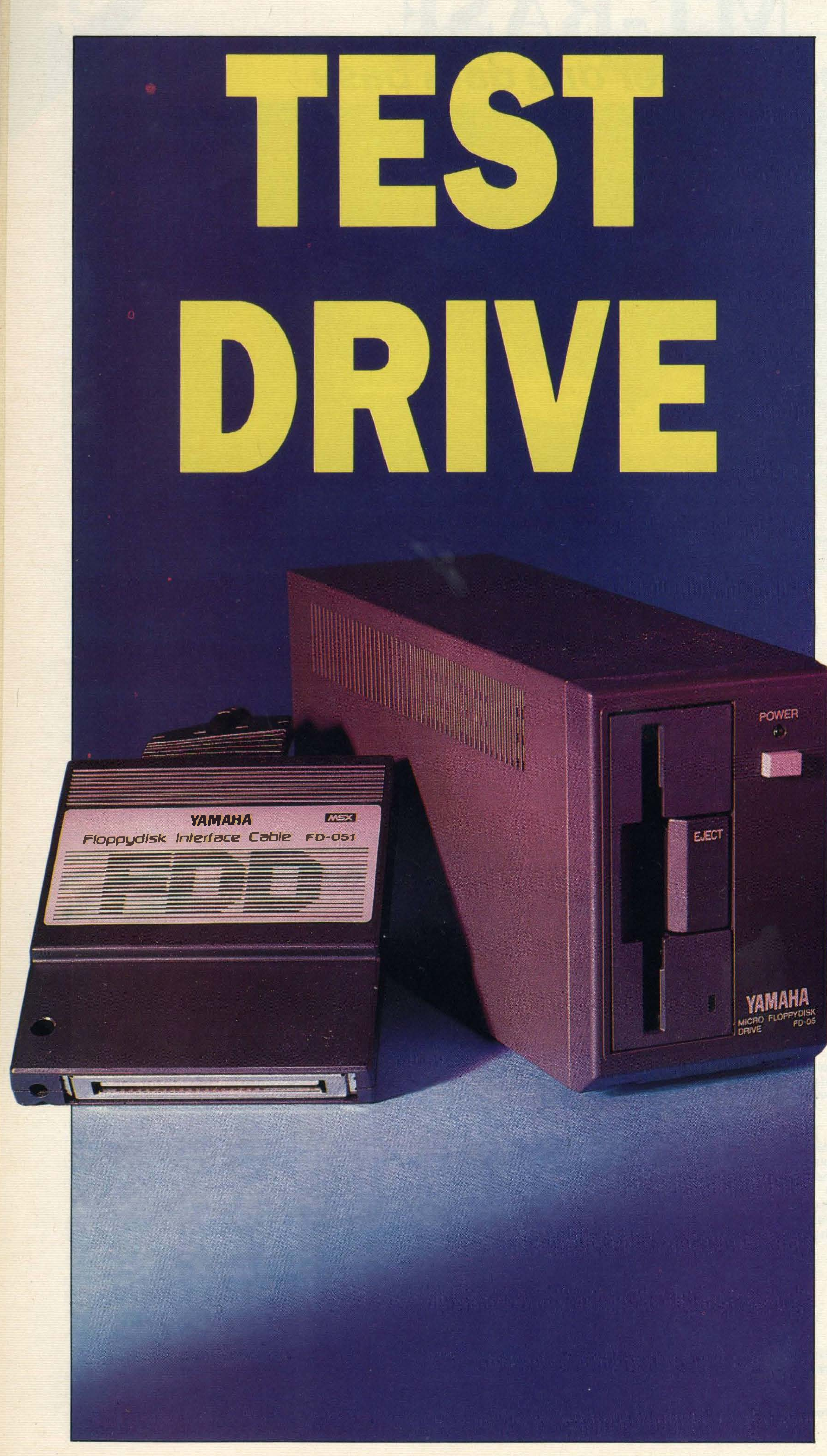
A graphic character set is included, and defining your own characters using the Riteman F+'s bit image control codes is possible. These areas aren't fully explained in the manual, which assumes that the reader is familiar with printer operation and occasionally serves to confuse rather than to explain.

Although the Riteman does have a few less features than the Epson GX-80, it is a superb printer and for £310 you could do a lot worse. ■

MSX PRINTER CABLES

To connect an MSX computer to a parallel interfaced printer you need a printer cable with a 14-pin amphenol (MSX printer socket) and a 36-pin amphenol (standard parallel printer connection). These can be obtained from the following suppliers:

Aztec Software £14.30
(0924) 497319
Boots the Chemist £9.95
Doug Packer £15
01-941 2560
Micro Peripherals £12.80
(0256) 473232



We put Yamaha's latest double-sided disk drive through its paces –is it really value for money?

Cassette tape users drink a lot of tea and coffee. After all, they have to do something while their programs are loading. A much faster and more convenient means of storing programs and data, and an excellent way to cut down your drinking, is to use a disk drive, like the FD-05 which Yamaha has just brought out.

A cassette system is certainly an inexpensive form of mass storage, both in terms of the hardware and the medium — that is, the tapes themselves. But there are severe limitations, including speed and the need to keep rewinding the tape after use.

Files load from disk in a fraction of the time taken with cassettes. And the facility to access any point on the disk at random makes for a highly flexible system. Naturally the cost is also much greater, but few people who make the move to disks regret the expense.

Most MSX manufacturers have standardised on the 3.5 inch disk format. Spectravideo had an early, but rarely seen 5.25 inch machine, and Sanyo has also brought out a drive using this format — mainly to provide some compatibility with the company's business micros.

The 3.5 inch drives all use 80 tracks and double density, giving storage capacity of 360K per side of the disk, once you've formatted it. The Yamaha model is unusual, though not unique, in that it is double sided, with the reverse being referred to as Drive B. Both sides of the disk are used giving a total storage of 720K per drive.

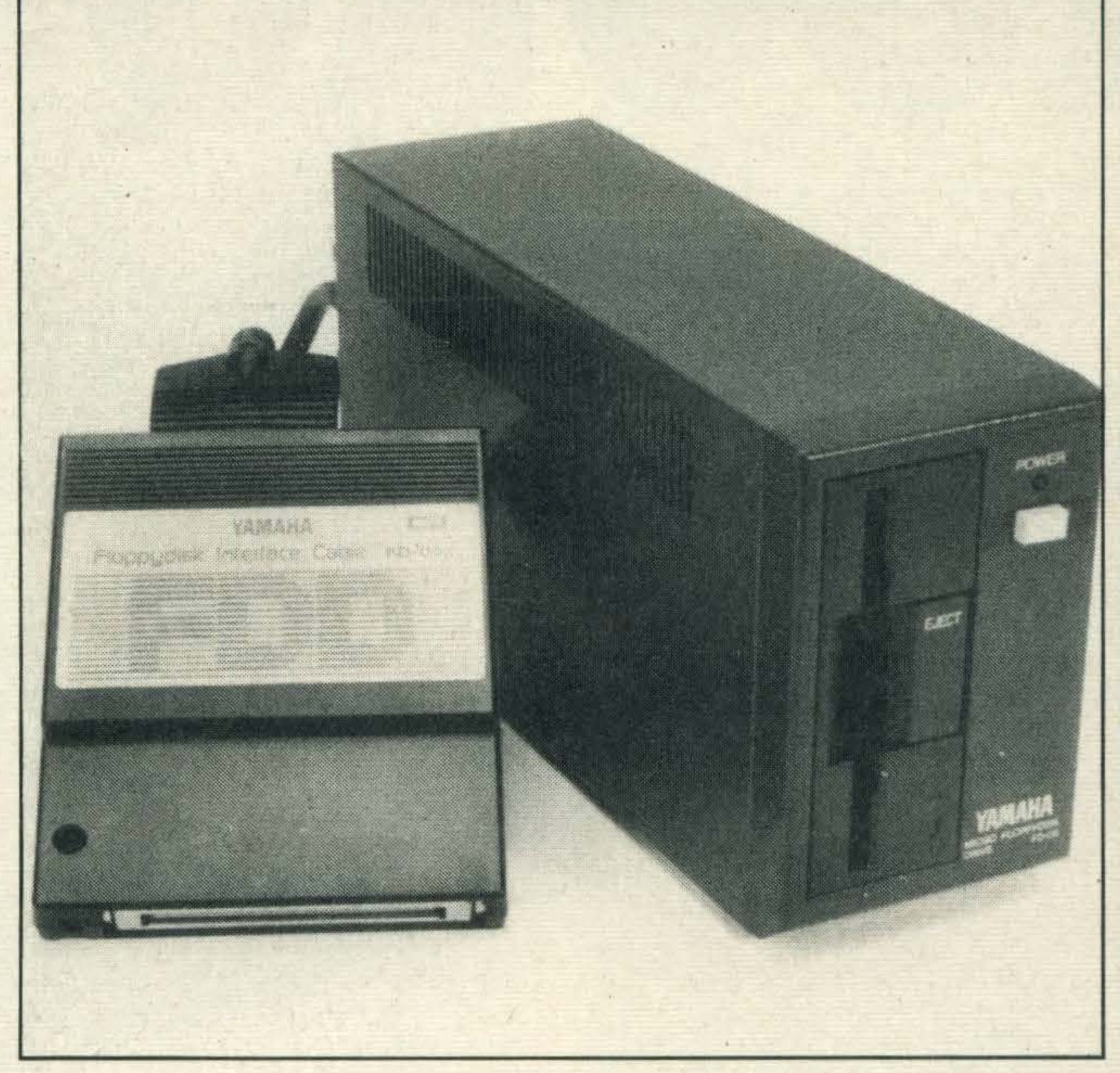
Although double sided blank disks are more expensive than single-sided ones, you'll have to do an awful lot of programming to fill up a disk, so they ultimately work out cheaper.

Like most of the other MSX disk drives, with the exception

YAMAHA FD-05 £399

SPECIFICATIONS

Format:	3.5 inch double sided
Tracks:	80
Capacity:	1 Mbyte (unformatted) 720 Kbytes (formatted
Transfer speed:	250 Kbits per sec
Access time:	95ms (average) 6ms (movement) 15ms (setting time)
Power usage:	less than 25W
Size:	81mm × 130mm × 252.5mm
Weight:	2.7kg (without disk)
Price:	£399 inc. interface
Distribution:	Kemble-Yamaha Music (UK) Ltd, Mount Avenue, Milton Keynes MK1 1JE



of the Sony, the Yamaha drive holds disks vertically. There is just one slight disadvantage to this which is that, when you're inserting and extracting the disk, its bottom edge is only a small distance above the table.

If you are untidy you'll find you will keep having to move papers, manuals, cartridges, ashtrays or whatever junk accumulates in the area of your computer, each time you change a disk.

In many ways this drive is similar to the JVC model. But it has one feature which the JVC lacks, and that's a busy light. It can be harmful to both the drive and the disk if you remove the latter while it's spinning.

You might think that nobody would be stupid enough to try it — as the disk only spins when commanded to, you should know when its in operation. Unfortunatley the disk often spins for some time after it has finished reading a file, and if you're in a rush it's very tempting to try to take it out too soon. The bright LED on the front of this drive helps to warn you against this possibly tragic act.

However, you won't always need the light. This drive makes enough noise when it's spinning to let you know it is working. Of course you don't get a deafening din, but just the odd graunch. Some people have been known to find this sound comforting, because it lets them know that something is actually happening in response to their typed commands.

The sound is far from rough. Indeed the drive seems to operate very smoothly, and quite fast too. Combined with its solid appearance and robust construction this helps to give it an air of efficiency and reliability. We'd certainly trust our precious data to this machine (while still making back-up copies, of course!)

One feature the FD-05 lacks is a dust cover for the disk slot. Even 3.5 inch floppies, with their sturdy cases and sliding covers, are horribly prone to damage from dust and dirt.

Getting the FD-05 to talk to your computer couldn't be easier. The drive is connected to the computer by standard interface cable. This terminates in a large cartridge at the micro end, so there are no guesses where you plug it in! On the back of the drive there are two main ports. The interface cable plugs into one. The other is for daisychaining another drive, which would give you around 1.4 Megabytes of online storage.

Should you use the drive with Yamaha's own micro, the CX-5M, you will immediately notice a problem. The computer has only one cartridge slot, so when the disk drive is plugged in you can't use any normal software cartridges, such as Yamaha's wonderful music packages.

The micro does have an expansion bus at the back, but this is of the edge connector variety, as found on some toy computers we could mention. However, Yamaha produces an adapter allowing you to plug cartridges or the disk drive in the back.

The interface cartridge comes complete with MSX disk BASIC, which contains most of the commands you're ever likely to need for handling disks. These include commands for random access files — one of the biggest advantages of using disks.

With cassettes the information is stored serially, and it's usually necessary to load a complete file into memory before you can use the data. This means the size of your file is limited by the spare memory capacity of the micro.

With disks you can read or write to any point in the file. Theoretically the file can be as large as the memory capacity of the disk, which in this case is a massive 720K. Only part of the file needs to be in the computer's memory at any one time.

What was noticeably missing from the drive we received was an MSX-DOS system disk. It's not clear whether this will be included with production drives (ours was an early pre-production sample).

MSX-DOS is the professional disk operation system, derived from the business standard MS-DOS. It's likely that a large number of the business software packages which will be coming on the the MSX market will run under this system. But it needs at least 64K of memory.

As Yamaha's own micro has only 32K this may be the reason MSX-DOS was not included in our sample package. However, the drive will quite happily run MSX-DOS with another micro, if you've got the system from elsewhere.

Two manuals were supplied with the drive, though one would be better described as a leaflet. This is the operating manual. It tells you how to connect the machine up to your computer and the mains, how to insert and remove disks, how to format disks and how to look after them. And that's about it as far as useful information is concerned.

The second manual, which is a complete guide to MSX disk BASIC, is rather fatter and much more interesting. We saw an incomplete pre-release copy, but even so it looks quite comprehensive. All the commands are explained in detail, with full syntax and examples. So there's no excuse for not using the machine fully or properly.

The overall styling of the drive is well up to the class of Yamaha's micro. It's finished in the same slate grey, with subtle lettering. The main power button is on the front, along with a bright green LED making it obvious when the machine is switched on. The busy light should really have been at the top too. Unfortunately it's low down, where it can get obscured.

To eject a disk you press a large button, right next to the slot and mounted flush with the front of the drive. Even without practice this button is easy and comfortable to use — you appreciate small details like that when you swap around a lot of disks.

The Yamaha FD-05 is a quality product. It's undoubtedly one of the better drives, mainly because it's double-sided, the only competitor being Mitsubishi. So if you're bored with tea and coffee, this drive would be a good investment. ■

COMPETITION

CURSORS!

TOSHIBA MSX
HX-S665 Bank Street WRITER
Broderbund Software



Toshiba's HX-10 has been one of the best selling MSX micros since it all began here a year or so ago. It's not surprising, with its sturdy design and competitive pricing, that it's been such a success.

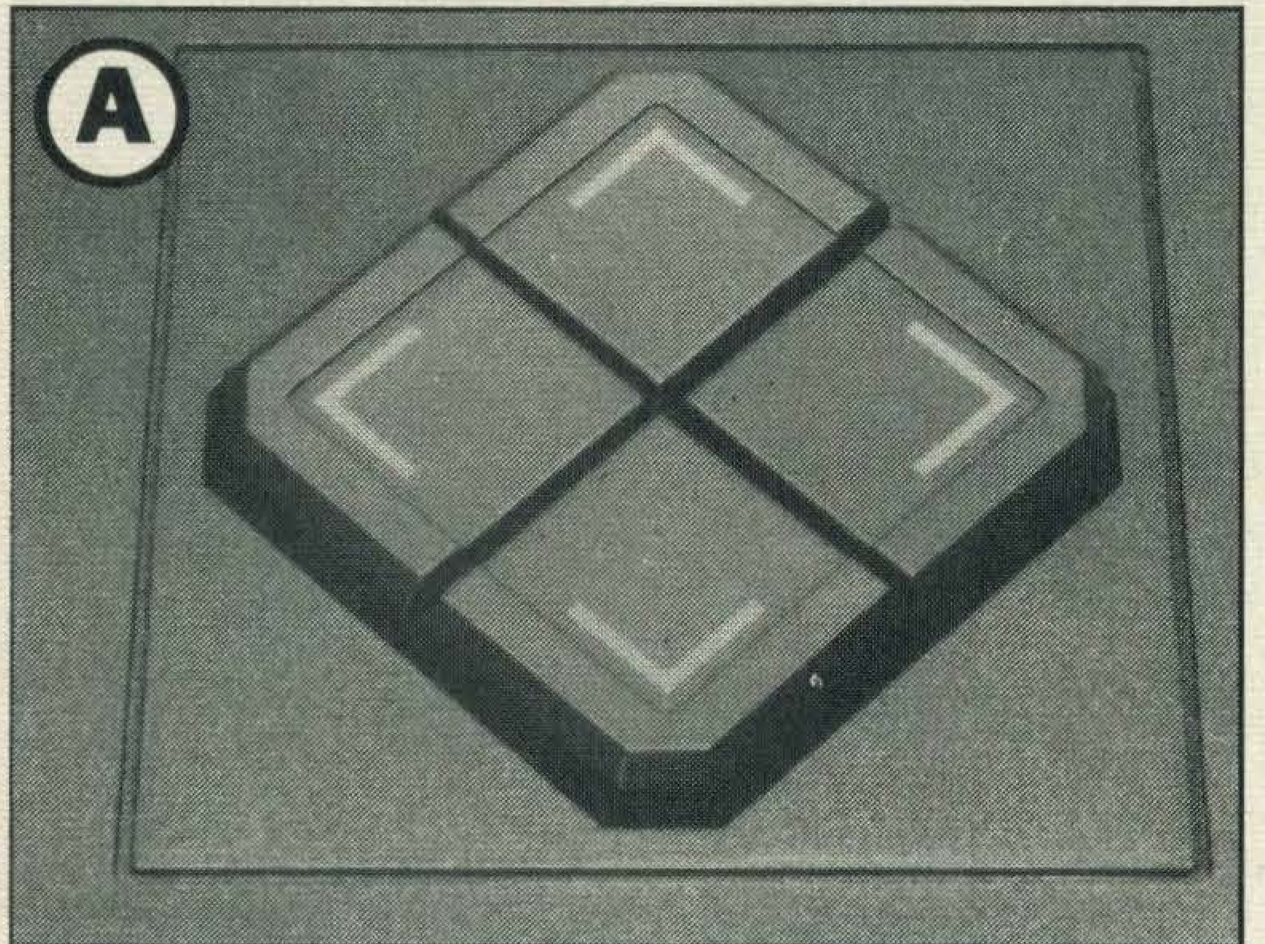
Well, now's your chance to win an HX-10 for yourself — together with Toshiba's brand new word processing cartridge, *The Bank Street Writer*.

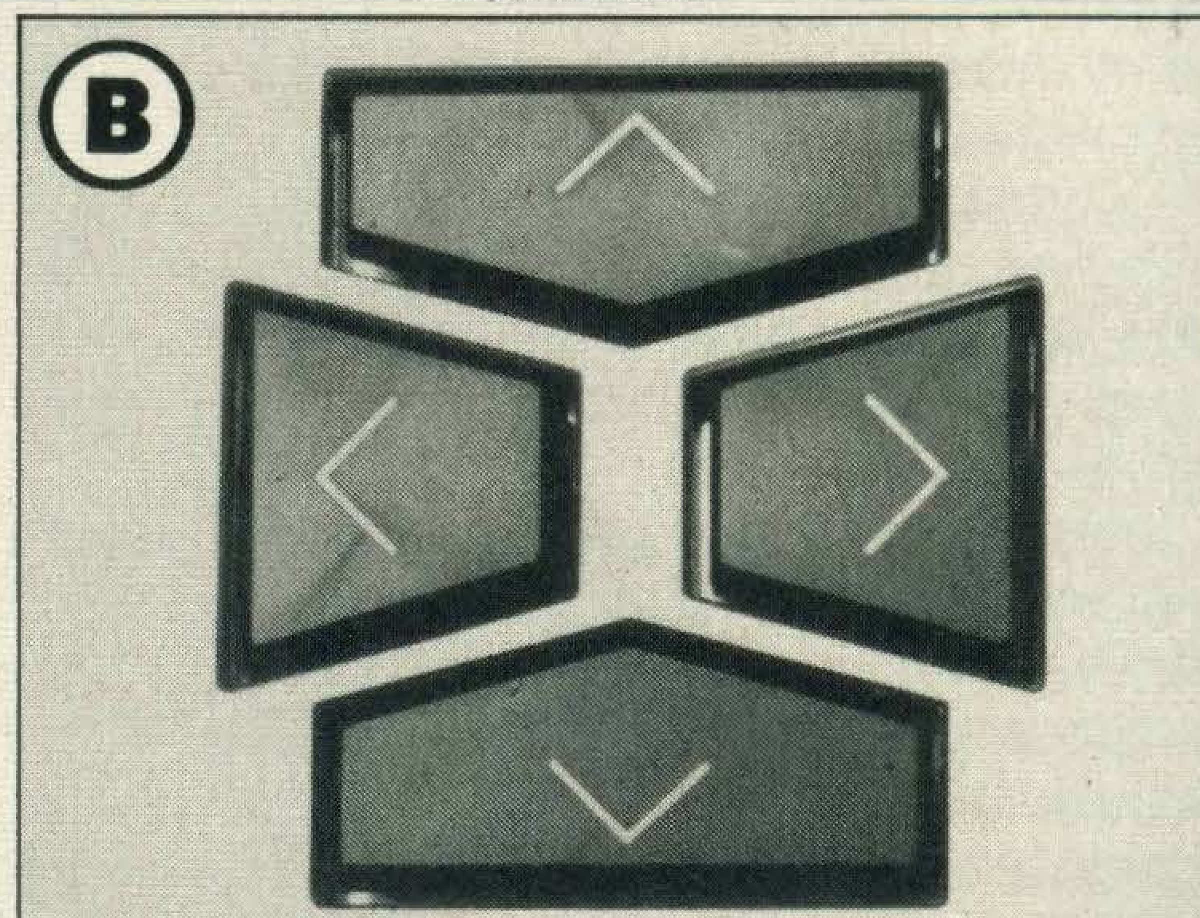
All you have to do is look at these close-up pictures of six MSX cursor keypads. We want you to tell us which MSX machine each keypad belongs to. So, if you think keypad A is the Canon V-20, write down A — Canon V-20 on the back of a postcard, and so on.

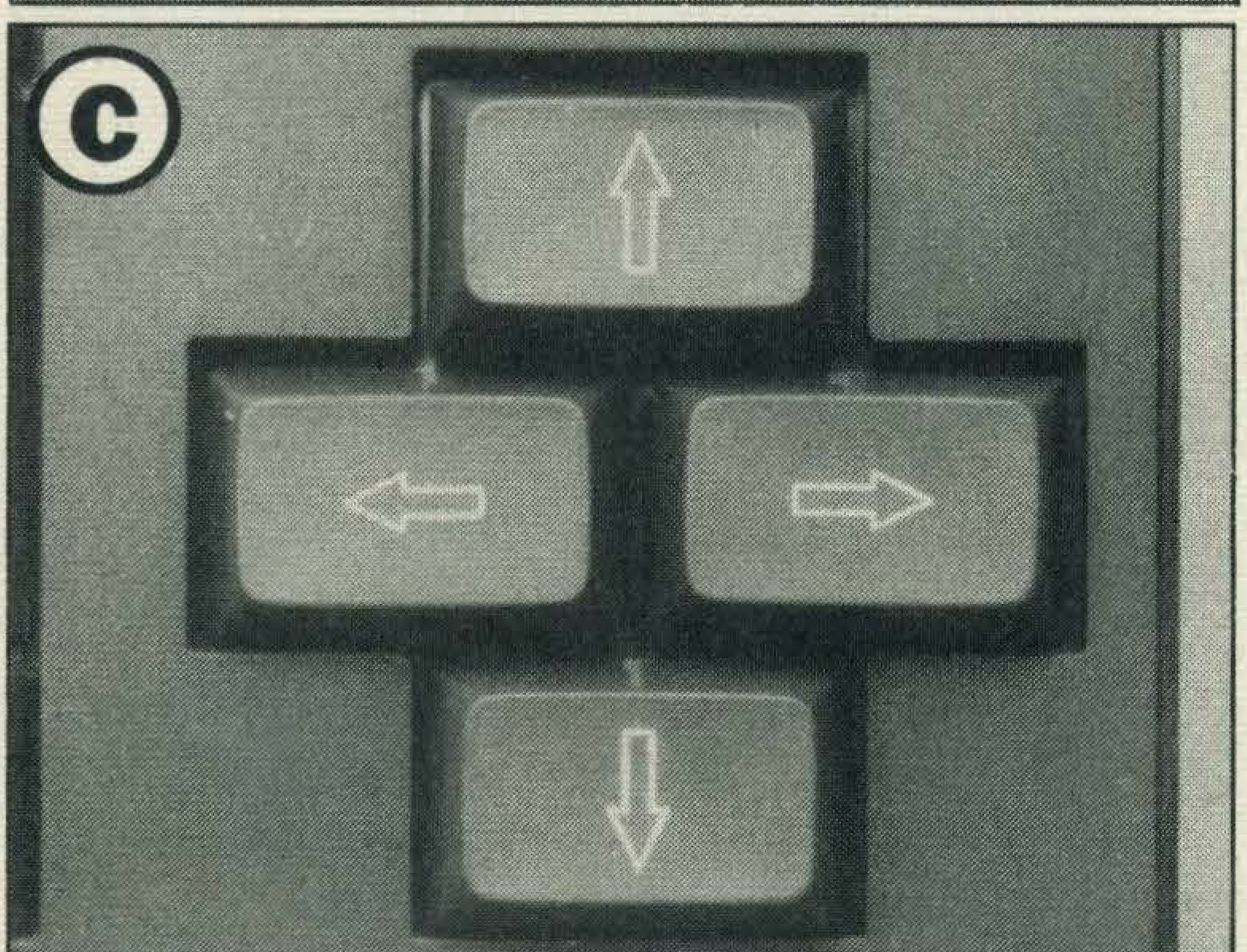
Address your card to Toshiba Competition, What MSX?, 38-42 Hampton Road, Teddington, Middx TW11 OJE to reach us by 20th January 1986.

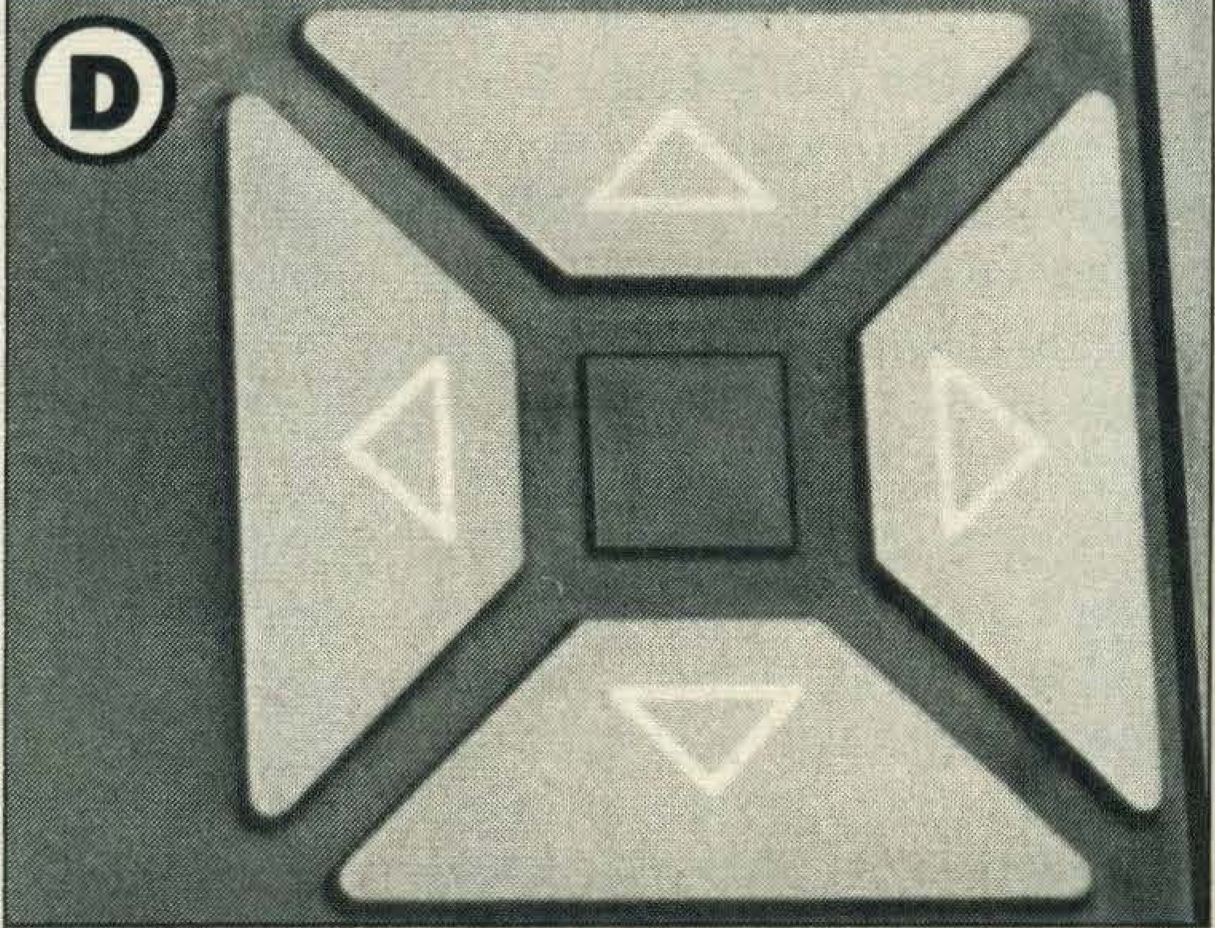
RULES

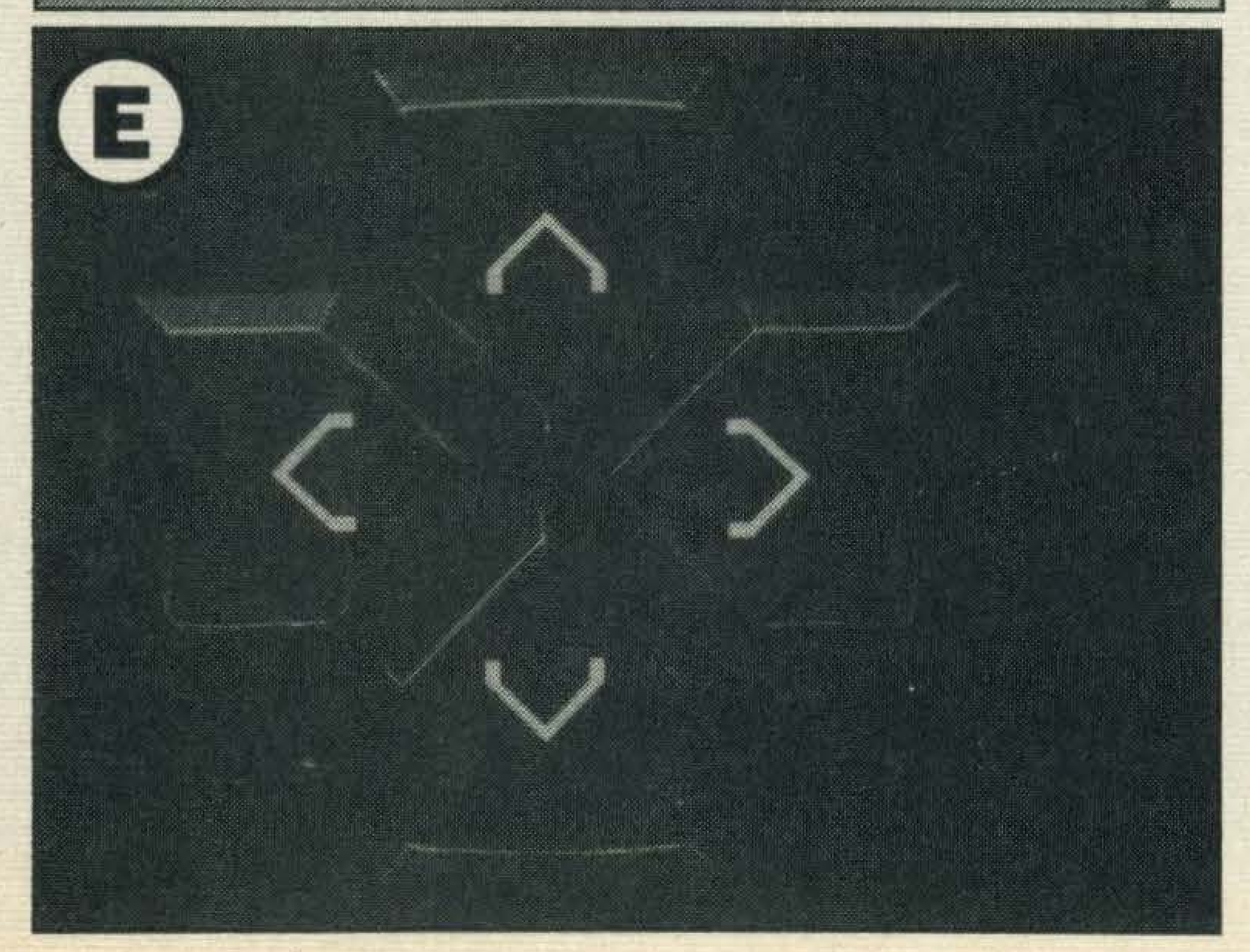
1. The judge's decision is final.
2. The competition is not open to employees of Haymarket Publishing or Toshiba, or their families.
3. The winner will be the first correct entry drawn from the bag.
4. The winner will be announced in the Spring issue of What MSX?













WINNERS

Mitsubishi competition

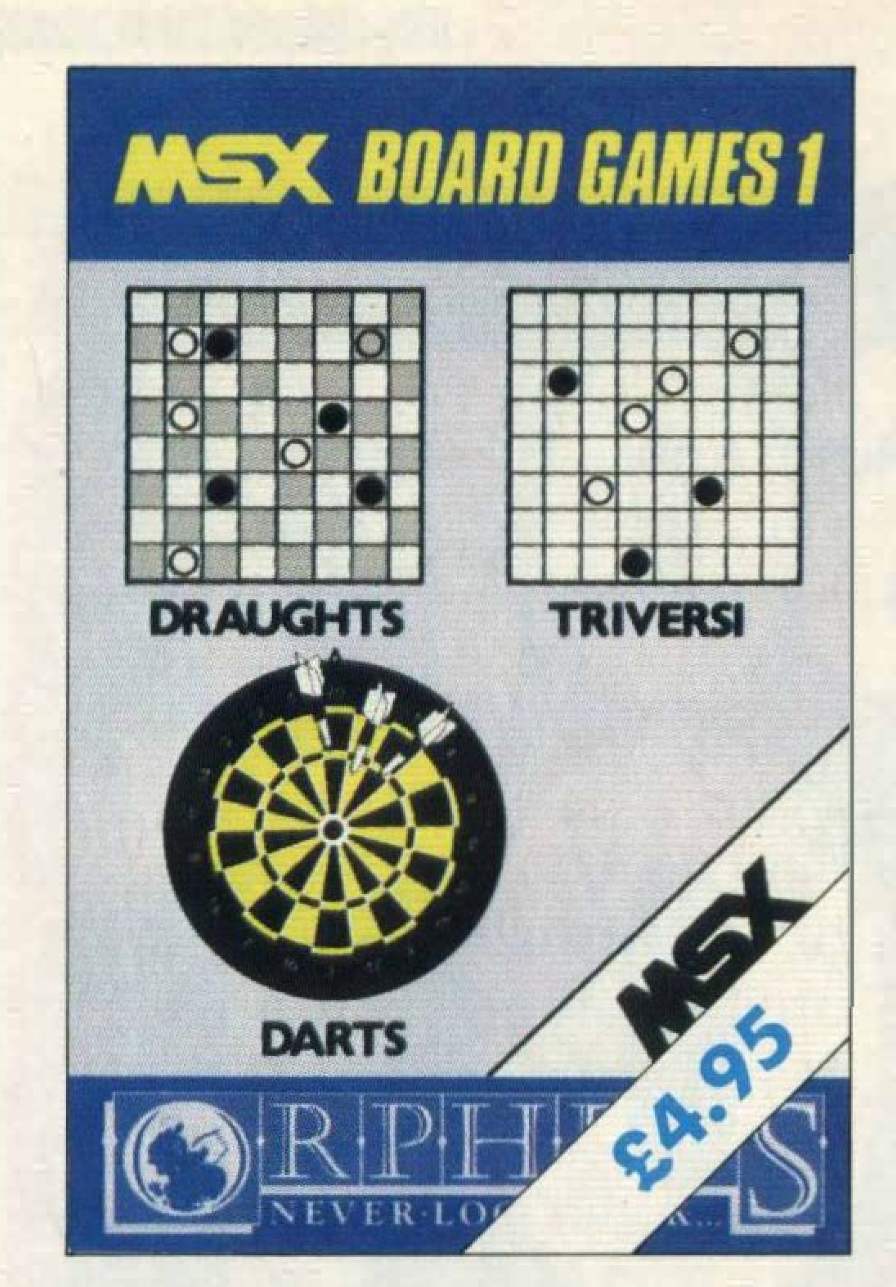
Congratulations to Mrs Jean Fryer, Richard Greenhill and Doug Selway who were the first three correct entries out of the hat. Each receives a Mitsubishi MLF-80 micro. The correct answer was ABCEFGHJKM.

Yamaha competition

Irene Sims was the first out of the hat with the winning answer: D B E A C. She receives a Yamaha CX-5M music computer complete with music keyboard and cartridge software.

Congratulations to all winners, who we will shortly be contacting by post.





MSX BOARD GAMES

A compendium of darts, draughts and Triversi (Othello for three players). These will appeal to all users, both the demonic arcade players and the more serious user to test their skills at playing the traditional board games on the television screen.

BOULDERDASH

This highly addictive arcade game involved Rockford, the hero you have to guide round the Boulder strewn depths of each maze. He's a cute little character with winking eyes and tapping feet. With dangerous butterflies, deadly fireflies and an amoeba growing out of control, all these and more have to be avoided in the dash from boulder to boulder in search of diamonds, especially at the high levels where even time is against you.

A classic game which will test your skill, courage and strategy to its limits.

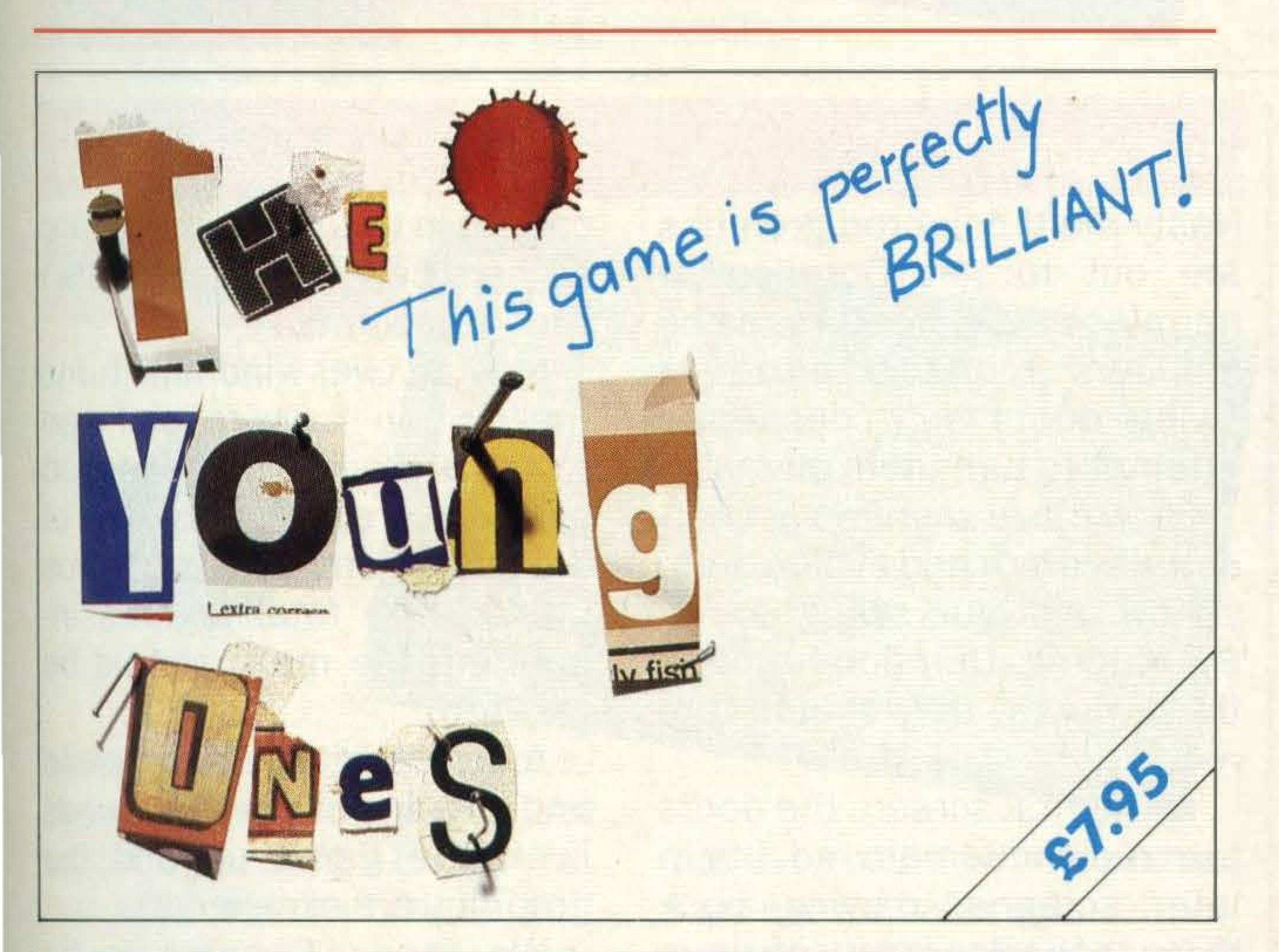
★ GAME OF THE MONTH. JULY – MSX COMPUTING



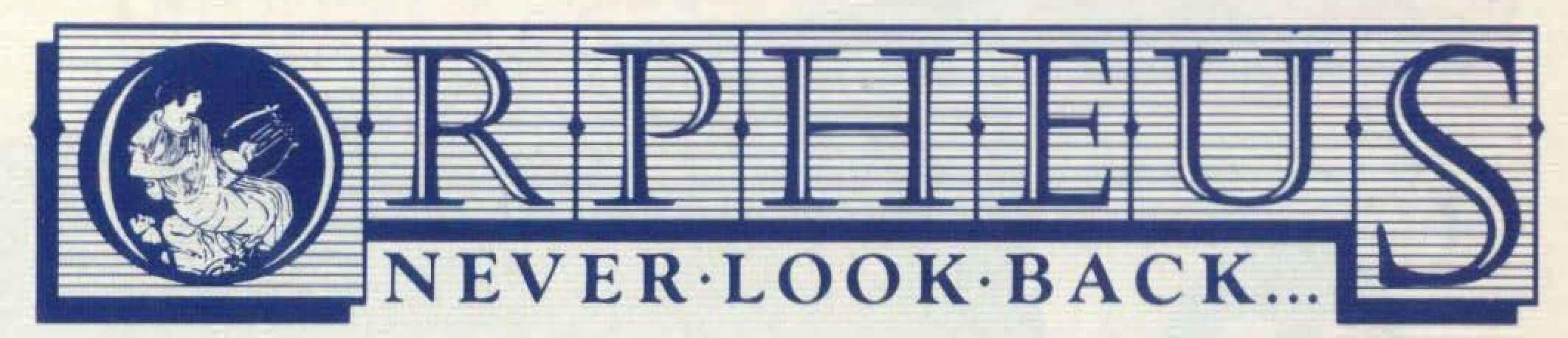
ELIDON

The game is based on Faerie mythology which has been popular with the young for many years. The player controls a beautifully animated Faerie which flies around the forest collecting magical objects which are needed to complete the game. There are several hundred rooms which are displayed with very close attention to detail. The music of Grieg is used to accompany the game. Elidon has been awarded several 'Best Buy of the Month' and 'Game of the Month' with Your 64 and Commodore Computing International, plus several excellent reviews on T.V.

★ GAME OF THE MONTH. Your 64



Orpheus Ltd., The Smithy, Unit 1, Church Farm,
Hatley St. George, Nr. Sandy, Beds. SG19 3HP
Tel. Gamlingay (0767) 51481/91 Telex 817117 ETHGEN G





TUJAD

The Tujad is a Josephson supercomputer that controls a fusion reactor orbiting Earth. It has gone berserk and the future of half the known galaxy is in the balance. You take control of one of the new GEN 19 multidroids, capable of running and flying and equipped with the latest weapons and neutron defensive shields. Your task is to search through the reactor, overcoming the automatic defensive mechanisms and piece together the circuit board needed to stop Tujad.

Please send me
_____ copies of BOULDERDASH @ £6.95
_____ copies of THE YOUNG ONES @ £7.95
_____ copies of TUJAD @ £8.95
_____ copies of MSX BOARDGAMES @ £4.95
_____ copies of ELIDON @ £8.95

P&P FREE (UK only); £2.00 P&P overseas.

Name: ______________________

Address: ______________________

Please make cheques or money orders payable to Orpheus Ltd and send together with your order form to: Orpheus Ltd, The Smithy, Unit 1, Church Farm, Hatley St. George, Nr. Sandy, Beds. SG19 3HP.

SOFT SPOT

The software flood continues as manufacturers churn out a steady stream of MSX titles. There's something for everyone — from arcade games to educational programs. The cartridge is still king when it comes to quality, at least as far as games are concerned. But we're also starting to see very inexpensive, but high quality cassette-based software. We've picked out a representative selection of the recent releases and put them through their paces, emerging bog-eyed and bleary to give you our thoughts. But remember, it's always best to try out a program for yourself before parting with the hard-earned readies!

Road Fighter — by Konami

Eat your heart out Niki Lauda because we've got hold of the fastest car in the racing business — a red hot roadster especially designed and brought to us by Konami.

We've spent the last fortnight thundering along race tracks through arctic wastelands, along cliff highways and over precarious suspension bridges.

Road Fighter is one of the best.

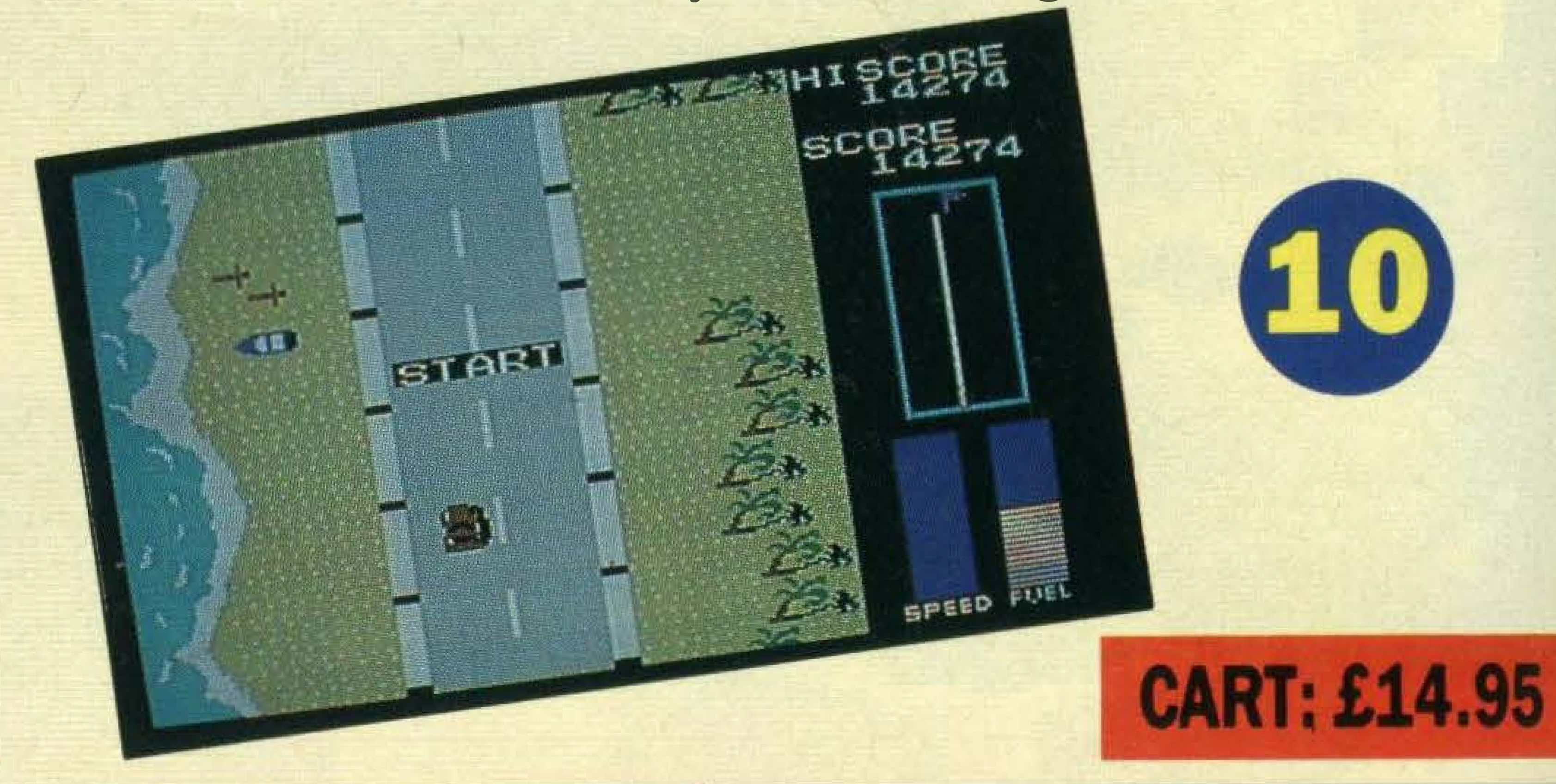
All the road racing action takes place on a grey road that twists and turns through various landscapes.

As you speed along, five other vehicle types inhabiting the road can cause you aggravation — the 18-wheelers chuck oil drums at you and purple GT cars knock you off the road.

Other dangers to watch out for are the twisty roads — these narrow suddenly from three lanes to two — oil slicks which send the car into a dangerous skid and your fuel supply. Driving over pink hearts lying on the road refills the tank.

Road Fighter's graphics are colourful, realistic and really liven the game up. The sound effects of cars skidding and exploding are fantastic.

This cartridge contains one of the best road racing games around and, at £14.95, it's a real bargain.

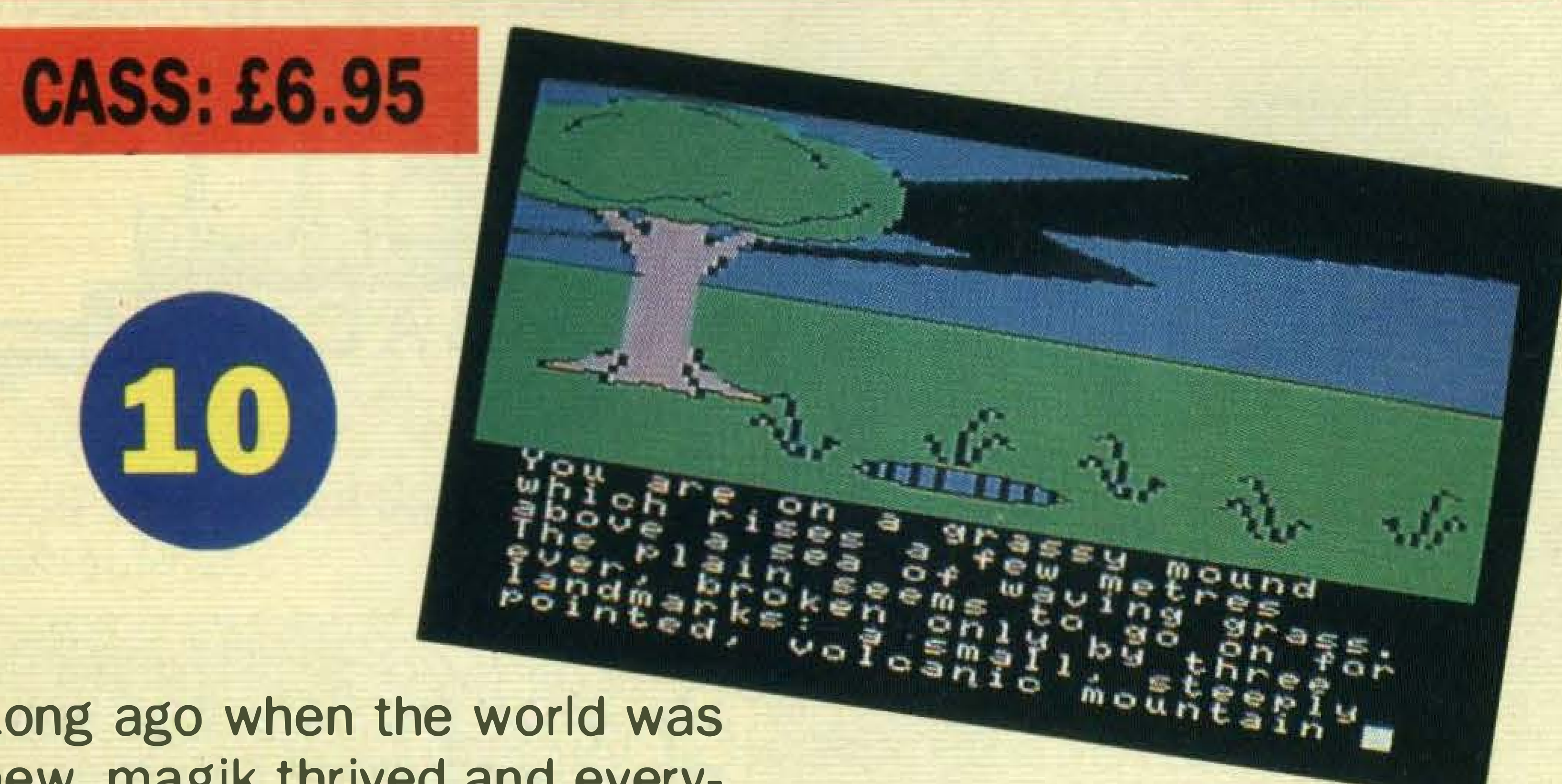


10

CART: £14.95

Red Moon — by Level 9

CASS: £6.95



10

Long ago when the world was new, magik thrived and everyone had a great time. But, the magik faded and a new magik source — the red moon crystal — was fashioned to replace it. But, alas it was stolen and retrieving it is what this game is all about.

Like most of Level 9's adventures, the story takes you through weird and wonderful places — sparkling rock rooms and alchemist's sanctums, such as the evil wizard of Aiken Dishun, Sog the Newtling and Drella the Troll.

Where it differs from other adventures, is that many of these characters have to be fought. Most fights can be avoided, but if you do attack without the right equipment, valuable hit points are lost.

In addition a magical spell system has been included. Casting spells helps to do things like locate objects, become temporarily stronger and attack enemies magically.

Valuable treasures and objects such as pink pills, purple lotions and acorns lie around and must be used to solve the game's abundant puzzles and riddles.

Graphics illustrate all locations, but they appear slowly and many people may prefer to turn them off.

Red Moon is yet another Level 9 gem — suitable for both novice and experienced adventurers alike.

Dorodon — by Sony

Nasty multi coloured gremlins are out to get Dorodon, a harmless little creature, as he blunders round a maze of swing doors in a desperate attempt to turn them all red.

Each maze scenario is characterised by a grid of blue dots, yellow and blue swing doors. By guiding Dorodon through these doors, they should turn red.

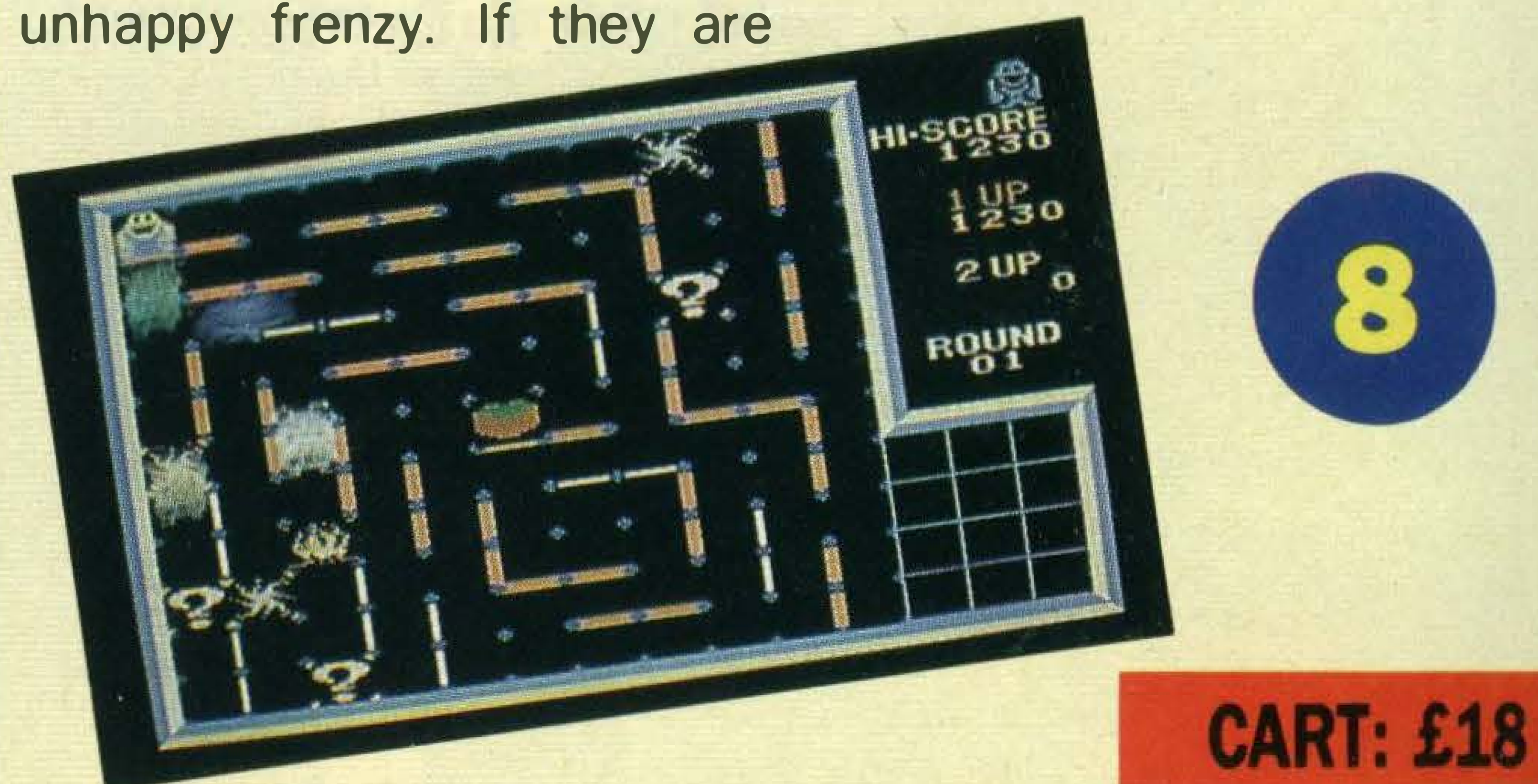
In the first screen, the doors turn red and remain red, but in later screens, moving back through the doors causes them to change back to blue or yellow — very frustrating!

Passing through metamorphic marks yields 100 points and leaves the gremlins in an unhappy frenzy. If they are caught in this state, points are gained. Collecting apples also wins you points.

Moving over windmills turns the screen haywire and can trap the gremlins. Imprisoned gremlins are kept at the side of the screen and gain you bonus points. The fatal logfires inhabiting the maze should be avoided.

A series of whistles, beeps and arcade pinball-like sounds liven the game up and the graphics are excellent.

We found *Dorodon* to be enchanting, addictive and it's possible to get a good score even if you're not a brilliant player. However, £18 is a lot to fork out for a game.



8

CART: £18

Sorcery — by Virgin Games

CASS: £8.95





The cassette inlay describes yet another scenario involving evil forces controlled by an evil Necromancer, ravaging the ancient lands.

It sounds corny, but don't be put off because it's one of the most original arcade games that we have seen in a long time.

You play the part of the sorcerer, moving from room to room — there are 50 in all — freeing all of the other sorcerers who will help in the fight against the Necromancer.

On your way, you'll come across various objects. Some have obvious uses such as swords and axes, but others are a little more obscure.

Moving from one room to the next seems simple — you just pass through the doors — but there are secret passages which can only be used in the right circumstances.

All the while your time and energy are running out, although it is possible to replenish the latter.

Very little documentation accompanies the program — annoying at first because so little is explained, but in the end we found that the game's attraction is to discover what isn't explained.

If you're looking for a game combining the best aspects of an arcade and adventure, *Sorcery* is worth considering, but beware, you could become very addicted.

Ghostbusters — by Activision

You've sung the song. You've seen the film. You've read the book. Now play the game. It's *Ghostbusters* and it's now on cassette.

Your aim is to run a *Ghostbusters* franchise at a profit and save New York from ghosts. The opportunity to purchase a vehicle and tools to complete the job are given to you and with them, you are meant to roam the city streets looking for ghosts to bust.

The Temple of Zuul rises in the city centre and yellow slimers can be seen crawling towards it. PK (psychokinetic) energy builds up, threatening destruction.

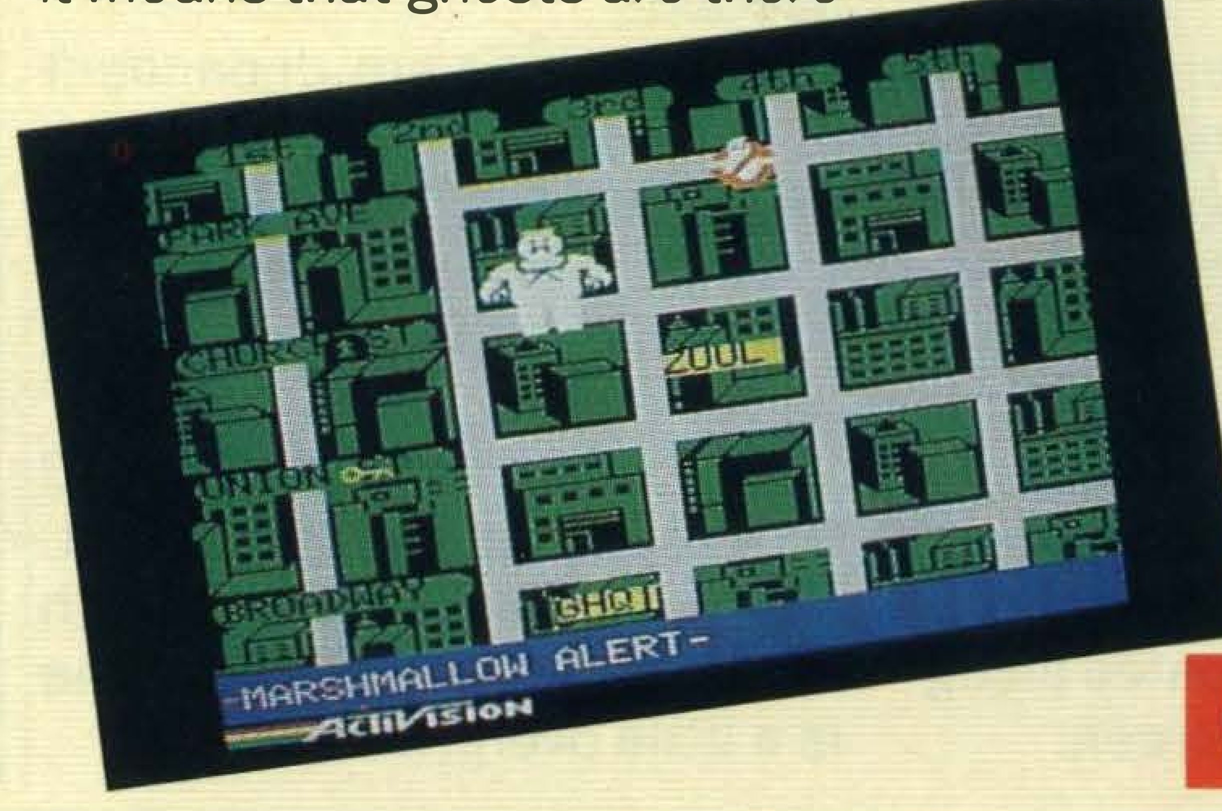
When a building flashes red, it means that ghosts are there and need catching. Using two men armed with negative ionisers and a trap, you catch the ghost — but it is a knack.

Money for the business is earned by collecting ghosts and stopping the marshmallow man who stomps towards the temple.

Eventually two unstoppable characters called the gatekeeper and Keymaster reach the temple. If you have more money than you started with, the next stage is reached.

At first, *Ghostbusters* seems to be quite complicated, but you'll soon get the hang of it.

Ghostbusters is a little pricey, but is original and full of variety.



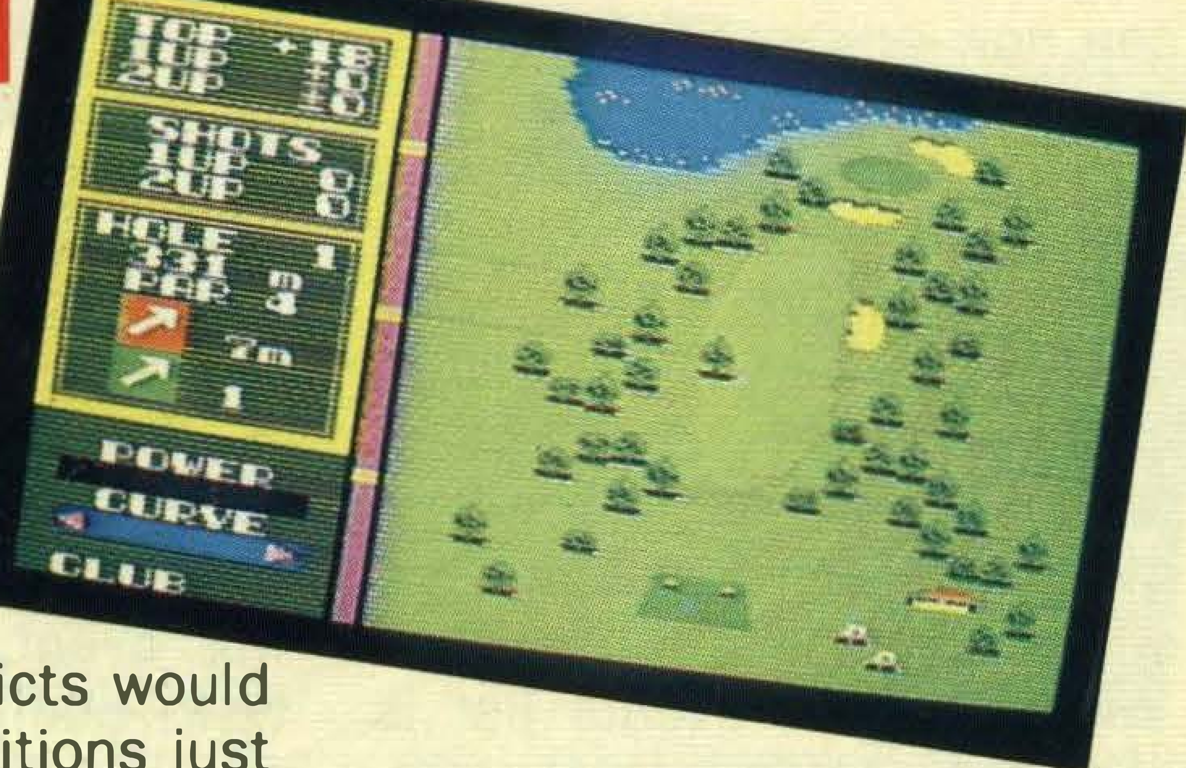
7

CASS: £11.99

Hole in One — by Morwood

CART: £14.95





Most golf mad addicts would brave blizzard conditions just to get their daily 18-hole fix, but with this cartridge, golf courses are a thing of the past.

It brilliantly simulates the golf game, but leaves out the unpleasant aspects such as the fortune lost in golf balls.

Before taking your first swing, carefully read the instructions because there is a lot of information to take in before you can play; wind direction, wind velocity, the different types of club and the distances between teeing-off and the hole.

The course covers a wide variety of landscapes — deserts, peninsulas, three-dimensional trees and wide expanses of water. This means that each of the 18 holes poses a different challenge.

All the information you need to take a shot is listed at one side of the screen and once everything is set up, you take the stroke and hope.

Once the ball moves onto the putting green, a close-up is shown together with the green's slope.

Skill and good judgement are need in *Hole in One* and after a few rounds, your game will rapidly improve.

Both golf players and non players will love this game. It is complicated enough to engage interest, generate enthusiasm and is definitely worth £14.95.

Pastfinder — by Activision

By the year 8878 A.D. exploration had become a thing of the past, except for a select band known as the Pastfinders.

In your capacity as an intrepid Pastfinder, you are in control of a Leeper, a spidery blue vehicle with the capacity to leap over obstacles, move very fast and slow down to a crawl.

Using this craft, you roam around the lands collecting artifacts. These need to be deposited at bases and stations — but first they have to be found.

Before starting on your quest, a map of the lands and a list of supplies are displayed. Supplies are crucial to your survival and include gadgets to slow down the Leeper's absorption of radiation, a protective shield, a signal scrambling device and a deradiator which helps eliminate radiation.

There are a huge variety of landscapes, most of them resembling obstacle courses. The obstacles — ridges, arches and disappearing doors — are deadly to touch so should be avoided at all costs. Enemy ships hover about or attack and can be shot for points.

Pastfinder combines the best qualities of an arcade, adventure and strategy game. It is a superb example of what a computer game can be.





CASS: £11.99

Eddie Kidd's Jump Challenge — by Martech

CASS: £7.95



5

Signing up sports personalities to endorse computer games seems all the rage at the moment and Martech has lost no time in signing up stuntsman Eddie Kidd to champion their game.

Jump Challenge is based on many of Eddie Kidd's past stunts including death defying leaps over oil barrels and rows of cars.

Our first few attempts were feeble, manoeuvring the bike is a lot more difficult then we anticipated.

Without developing the bike skills you're not going to get very far so we spent much time familiarising ourselves with the gears, revs, speed and brake controls indicated along the bottom of the screen.

Leaping off the ramp can only be achieved by trial and error — we repeatedly crashed the bike and broke Eddie's neck! But, eventually we cracked it and discovered that jumping was the easy bit — maintaining control and landing intact is where all the skill is needed.

High scores are dependent on getting the bike's back wheel to hit the ramp on landing. If you miss even by a cat's whisker, no score is chalked up.

Overall we were impressed with the graphics and sound, but it doesn't offer enough action and at £7.95, the game is a little overpriced.

Pairs — by Panasonic

Pairs is described as a 'fun real-time matching game' in the game's instructions and that is exactly what it is.

On the first screen, 20 cards are laid out on a four by five grid and pictures of 10 varieties of fruit including pineapples, apples and lemon slices decorate each card.

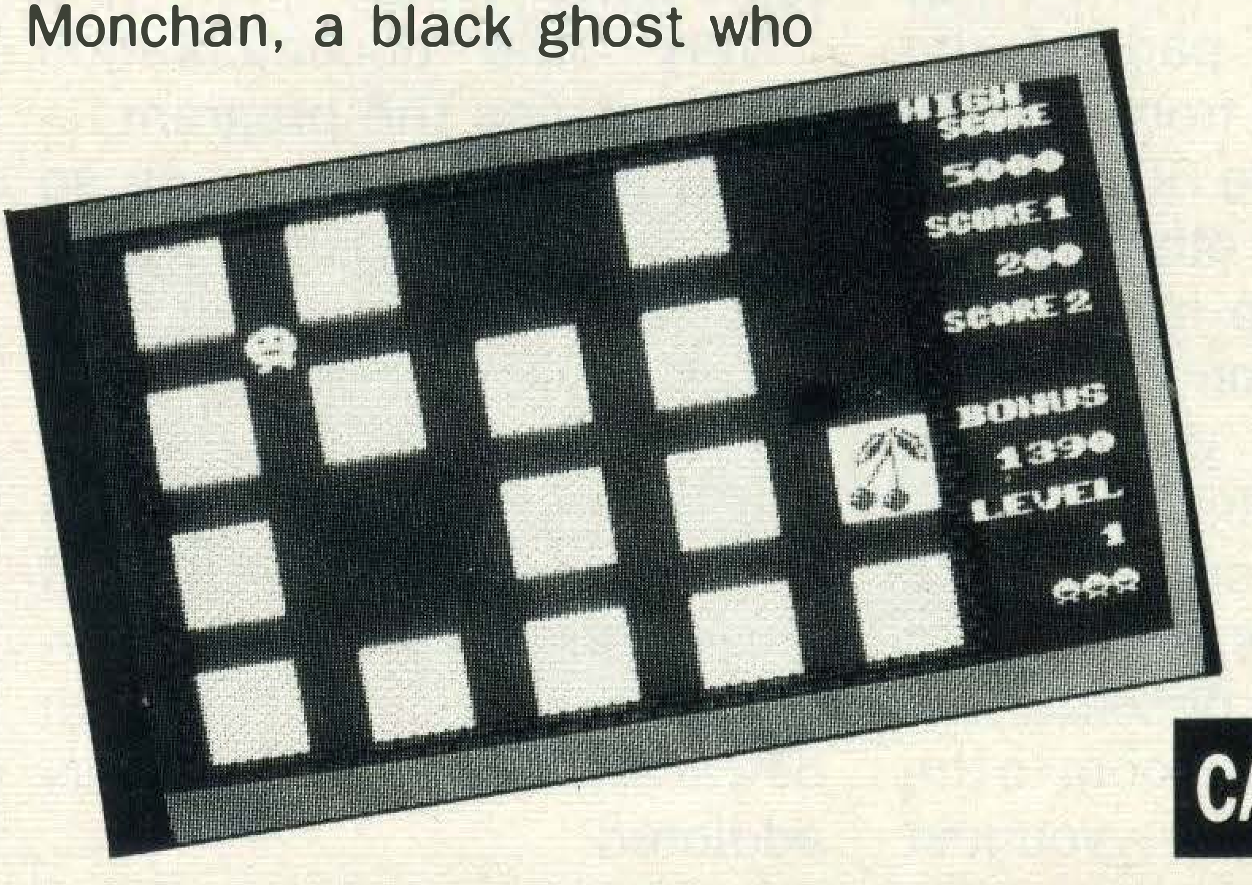
The idea is to guide Koppe, a little smiling face with legs and a tail, around the cards flipping them over one by one. By memorising the locations of the fruit, you should eventually be able to match the pairs up.

Making life difficult are a time limit giving you very little time for dilly dallying and Monchan, a black ghost who chases Koppe and annihilates him on contact.

Vegetables form the theme of the second level and this time two ghosts make their appearance. Completing the third screen which features animal cards, automatically brings you back to the fruits, but this time, the pace gets a little faster.

The graphics in *Pairs* are colourful and amusing and musical accompaniment is jolly and tuneful.

Pairs is a hectic game and you'll probably end up with cramped fingers and sore arms. Still it's an excellent game, although a pricey one.

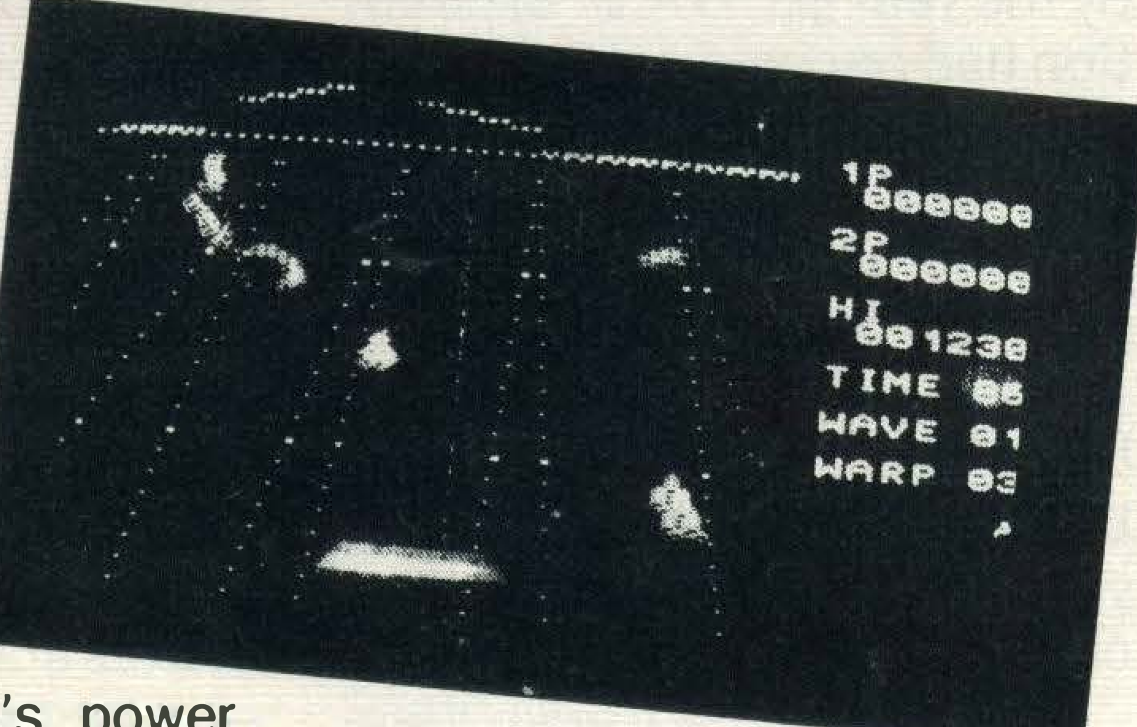


7

CART: £18.80

Juno First — by Sony

CART: £18



8

Destroy the enemy's power station and save the world from an alien invasion. If this theme sounds familiar — it is, but it's still one of the best subjects to shape a computer game around.

You are controlling Juno First — an atomic turbine space fighter no less — and are supposed to zap all oncoming enemy space vehicles.

As in *Space Invaders*, Juno's movement is restricted to the bottom of the screen and it has to avoid the lethal white bombs dropped by enemy ships.

A set of indicators inform players at what stage of the game they are, score, high score, number of enemy waves negotiated, time remaining in which to destroy the enemy, the number of warps left and the remaining fighters.

A time limit of 100 very rapid seconds is awarded to destroy each enemy wave.

Varying the game speed provides variety and moving time warps is a good way of extricating yourself from a sticky situation.

Zapping the green blob otherwise known as the magnetic power station turns the screen green and reveals the red power source.

Graphic and sound effects are good and if you enjoy the occasional spell of alien bashing, get this — if you can afford it.

Brian Jacks Superstar Challenge — by Martech

Armchair sports enthusiasts can now enjoy the thrills and spills of winning the 100 metres, scoring a bulls eye in archery and scoring a hat trick in football without so much as a flick of the wrist.

Superstar Challenge contains eight games and requires a player with a competitive streak and a desire to win.

First on the events list is canoeing, but try as we might, the canoe wouldn't pick up speed. But, we still qualified and continued on to the next event — arm dips.

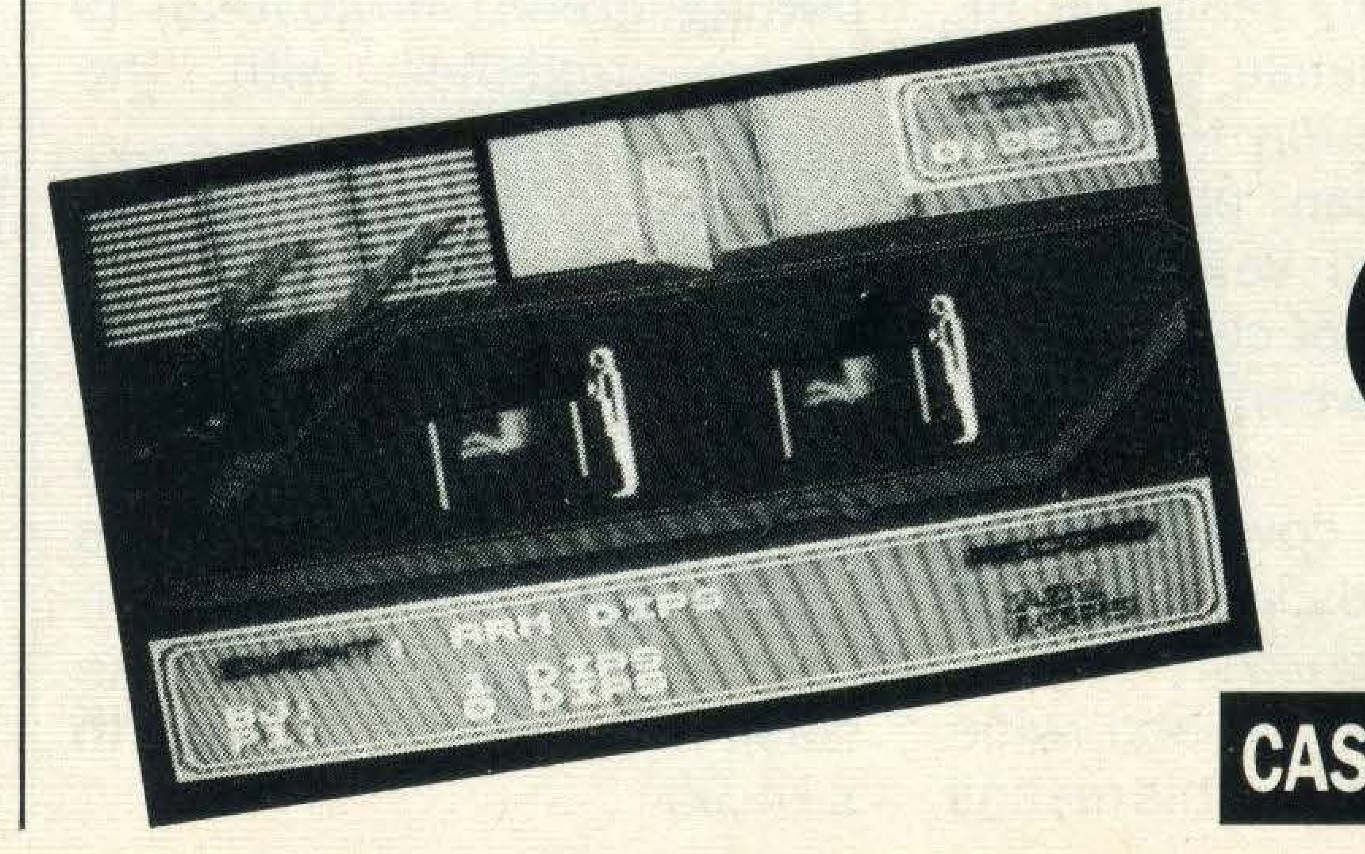
It was a real struggle; with sweat pouring from the brow we managed to notch up . . . 11.

Squat thrusts proved to be just as taxing and it was welcome relief to cool off in the swimming pool.

As for football, we could probably have fared better if the graphics had been better quality and the goalkeeper hadn't feigned dead.

Cycling was the most exciting event, but again would have been vastly better with improved graphics.

We've been spoilt with Konami's series of athletic games on cartridge. They've set up a superb standard for sports programs. Admittedly, this game is on cassette, but there is no reason why it shouldn't be just as good.



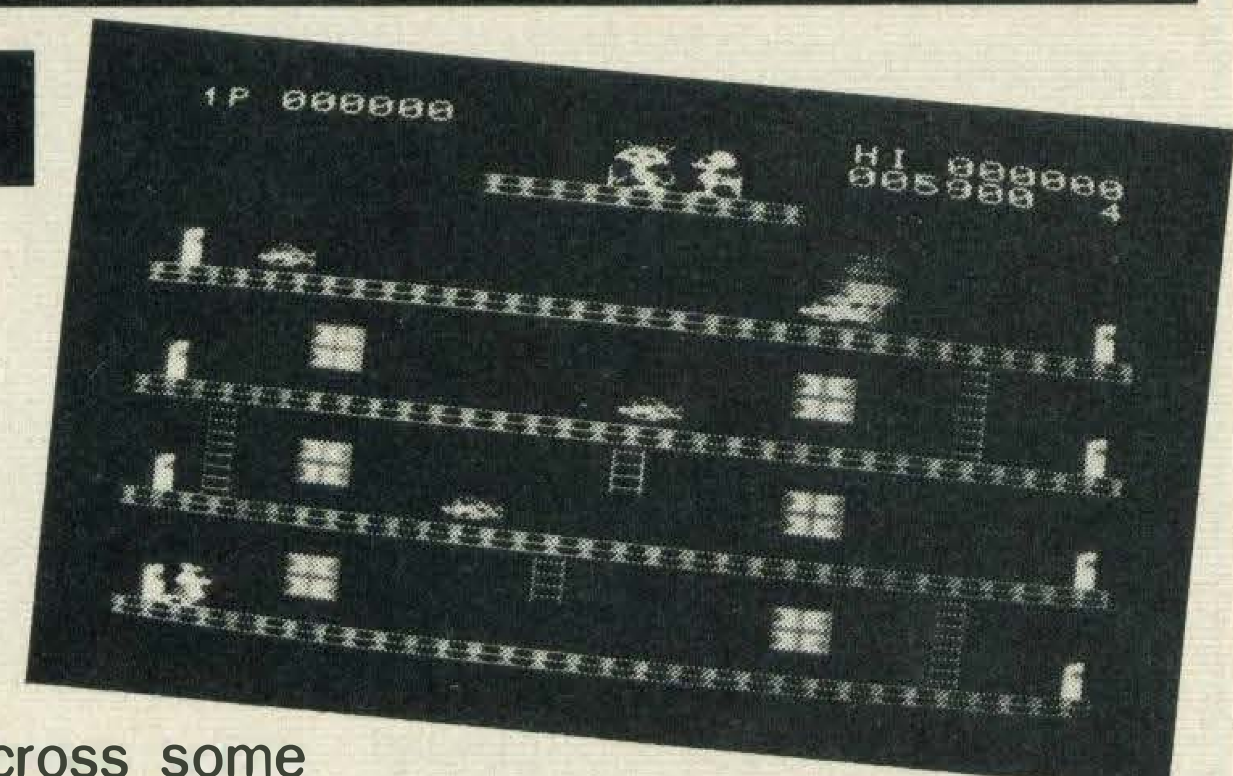
7

CASS: £7.95

Mouser — by Sony

CART: £18





We have come across some pretty extraordinary games in our time with titles to match, but *Mouser* is one of the strangest.

It is based on the familiar cat chasing mouse theme, but there isn't a mouse to be seen anywhere — only rats!

The idea is to rescue Tom's girlfriend, Kitty who is being held hostage by the Frat Rats on the fifth floor.

As Tom tries to climb up, Boss rat chucks down quantities of flowerpots and rolling balls. As well as avoiding these, Tom has to eat the fish liberally strewn around on each floor.

Sounds easy, but there is a catch — the ladder from fourth to fifth floor is missing and will only appear after Tom has caught a certain number of rats.

When Kitty is finally rescued, the event is heralded with a quick burst of Mendelssohn's wedding march — very sweet!

On level two, the going really gets tough, twirling spanners and dynamite (they don't kid around these rats!) attack Tom together with more flower pots and missing platforms.

Our only complaint is that the graphics, although excellent, tend to flicker when Tom is balanced between floors.

If you are bored with adventure games, alien zapping and need something light hearted and amusing, then do consider *Mouser*.

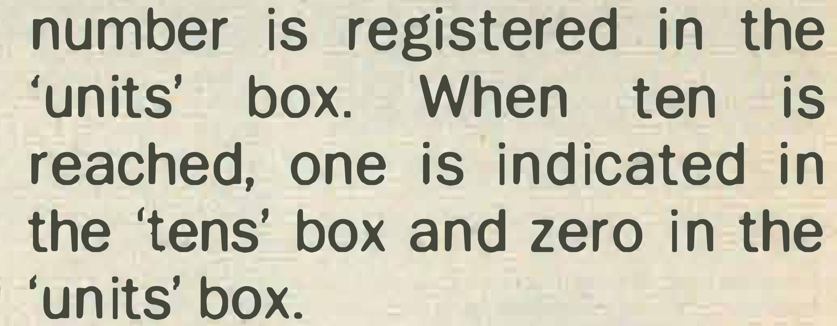
Tens and units — by Spectravideo

Most three year olds are intrigued with brightly coloured toys and watching *Playschool*. With this in mind, Mentor has developed a mathematics package with the maximum content of attractive graphics and the minimum of text.

Tens and Units is pitched at the three to seven age range which seems a pretty broad spectrum for one program.

The program is divided into eight sections and the first four use different graphics to convey the same information; a tree full of apples, cars coming out of a garage, candles on a birthday cake and coloured boxes are used.

As each object appears, a

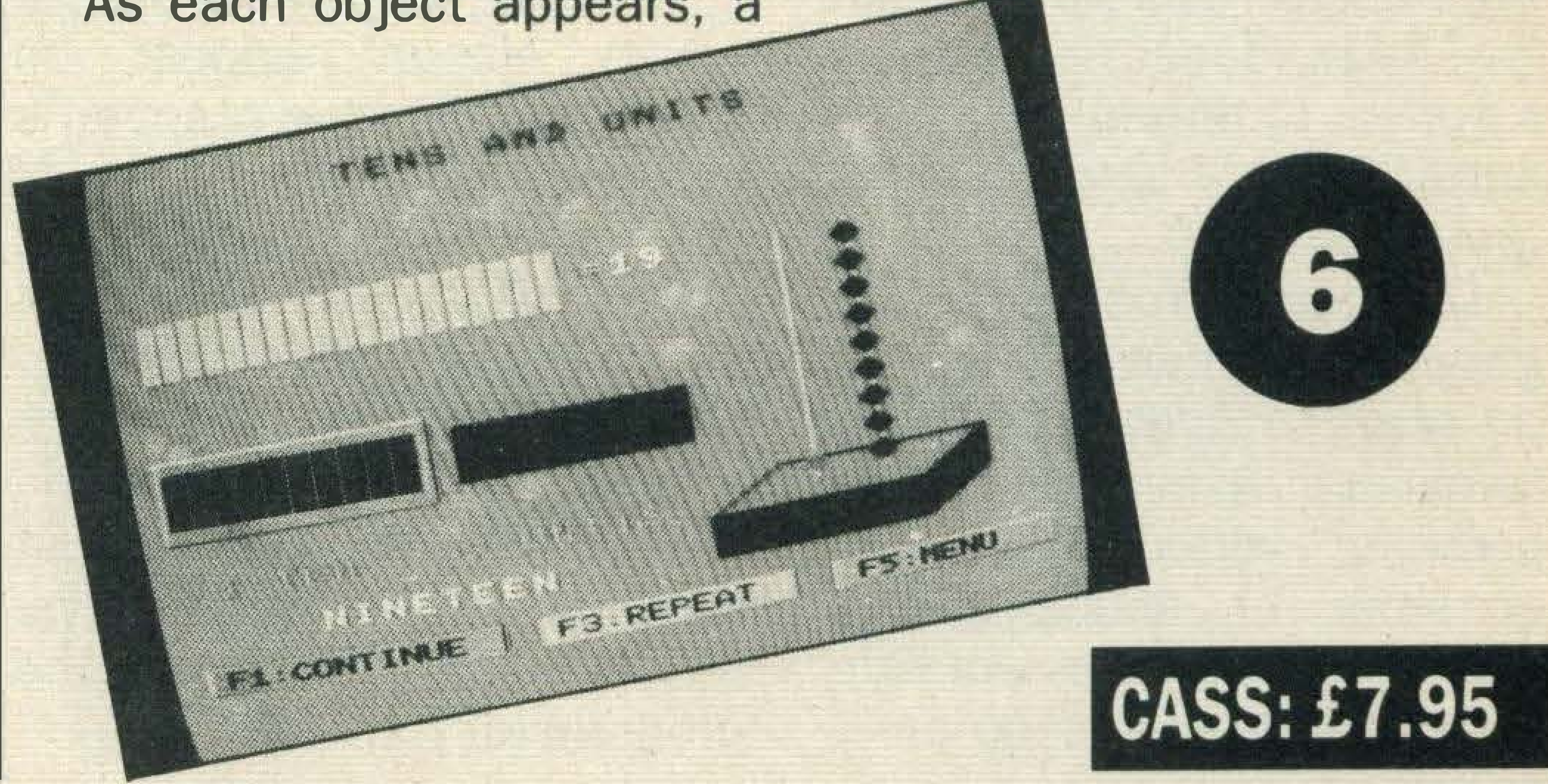


number is registered in the 'units' box. When ten is reached, one is indicated in the 'tens' box and zero in the 'units' box.

An abacus is used in the remaining four sections and displays the concept of dividing objects into groups of ten.

Mentor's inevitable four problems follow these number exercises and guessing the number on the abacus is the aim.

After going through *Tens and Units* which costs £7.95, we feel that better value for money could have been offered. For example, more sections and problems.

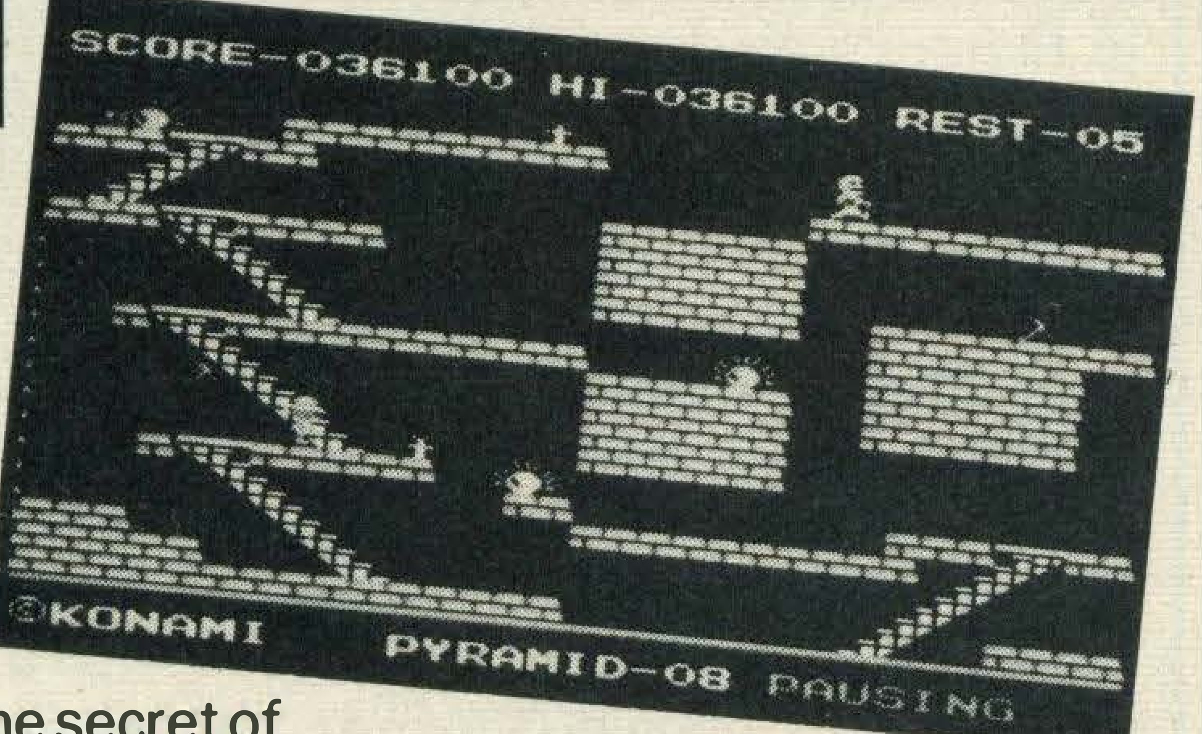


CASS: £7.95

King's Valley — by Konami

CART: £14.95





Fame, fortune and the secret of eternal life lie beneath the Valley of the Pharoahs just waiting for Vick, the famous archaeologist, to go and find them.

Of course it's no easy task; not only did the pharoahs employ the best tomb architects to design the crypts, but dangerous mummies are wondering around the pyramids guarding the mysterious sparkling jewels.

Gathering all these precious stones will reveal the secret of eternal life.

Once in the first pyramid, you have to act quickly because two mummies suddenly materialise and follow you around. Jumping over them or flinging one of the swords scattered around is the only way to avoid certain death.

Besides getting through all the pyramid levels, you've got to win points and the best way of doing so is to knock down mummies and collect jewels. Some of the jewels are hidden in brick boxes.

Four mummy types exist; red ones walk slowly and then rush up and down the ladders, white ones just wonder along slowly while the blue and yellow ones leap up and down as they move along.

King's Valley is the sort of game that will have you hooked, the graphics and sound effects utilise MSX's capabilities brilliantly and it's another winner from Konami.

Crazy Train — by Sony

Crazy Train is basically a huge mobile puzzle built out of railway tracks and stations on a square grid.

The idea is to successfully manoeuvre your train along tracks and through stations, but as in all good games, there are a number of obstacles to overcome.

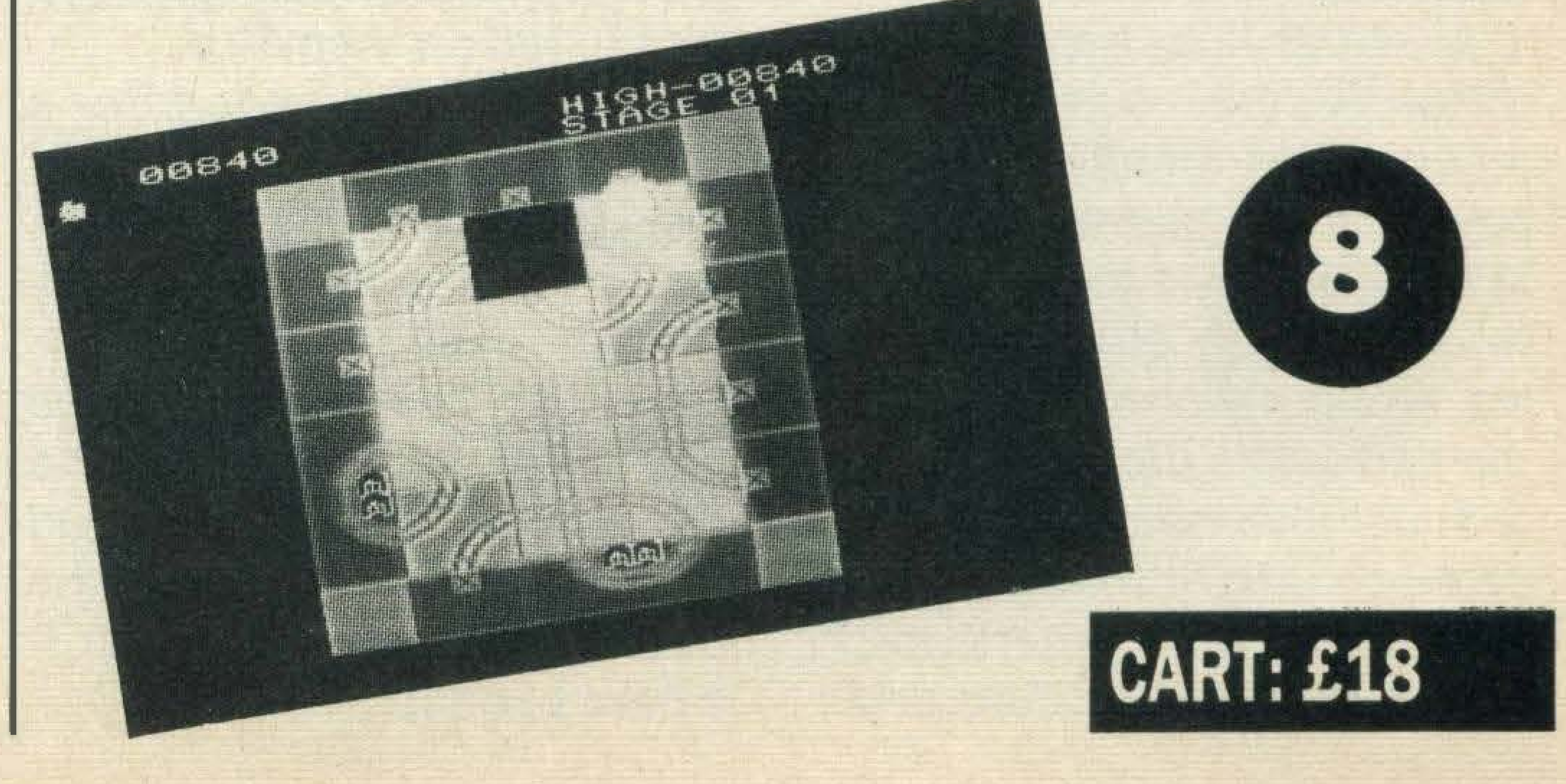
For a start, part of the puzzle is missing and so you have to keep juggling sections of track by moving parts of the grid around. In this way you make sure the train doesn't derail, crash or collide with an oncoming train.

The longer you keep the train running, the more points you notch up. Points are also scored for calling at all the stations. Variation is added by plunging you into darkness.

In later stages, the game gets quite difficult with aggressive enemy trains, dead ends and more stations.

Strategic planning is the key to success with this game and as there are 43 stages to get through, it pays to plan your moves carefully.

As the train moves round the tracks, a realistic chugging noise can be heard together with whistles. Although at £18, the game is well out of reach of the pocket money brigade, it could be well worth saving up for.



CART: £18

Psychedelia — by Llamasoft

CASS: £6





When we first saw this product, we thought we had a real klutz of a program on our hands. For instance, we were exhorted to 'freak out with it, blow your minds and freak out your granny' in the accompanying leaflet.

It didn't bode well for a program billed as a light synthesiser. Still we set aside prejudice, loaded up and to our surprise it turned out to be entertaining, versatile and great fun.

The idea is to use the MSX to generate a dynamic light show on screen. Eight pre-set patterns are available and by pressing various keys, it's possible to change sprite shapes and alter the symmetry of patterns. Besides the inevitable llama shapes there are seven shapes in all.

Once you get the feel of *Psychedelia*, start to experiment. Most things can be altered, for example you can choose any seven colours from a palette of 14 tones.

You can have from one to seven colours appear on screen at once. Cursor speed is variable too.

In addition, light pulses, length of colour lines, the smoothness with which patterns can be changed can all be altered.

Obviously *Psychedelia* won't appeal to all tastes, but if you like doodling, this could be the program for you.

Emerald Isle — by Level 9

Over the centuries, many have entered an area known as the Bermuda Triangle never to be seen again. The team at Level 9 can now reveal the true fate of these missing persons.

They are trapped on the weird and wonderful Emerald Isle somewhere in the Caribbean.

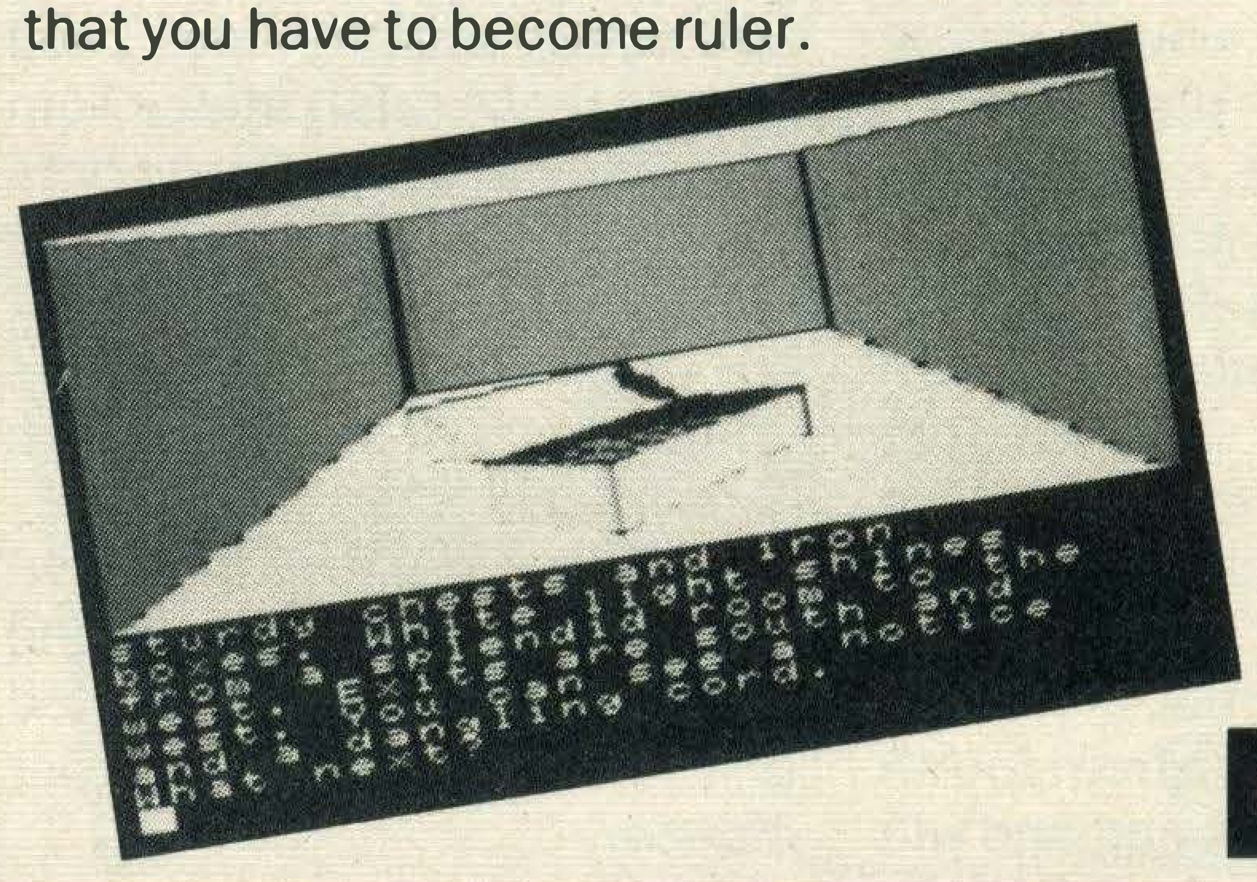
You are cast as the pilot who parted company with his aircraft just before it plummeted into the sea. Fortunately, you and your parachute drift gently towards Emerald Isle.

Once on the ground, you start adventuring proper. What you are looking for is a means of leaving the island and to do that you have to become ruler.

Scoring is murderously difficult. After hours of play, you are lucky if you can gain more than 50 out of a possible 1,000 points.

The scope of the game is impressive with over 200 locations to visit, each with an accompanying picture. Modes of transport are varied, including a railway system with a timetable more confusing than British Rail's southern region.

Level 9's claim that *Emerald Isle* is easier to solve than its other adventures explains its low price tag. The price in no way reflects the quality and once again Level 9 has come up with an absolute winner.



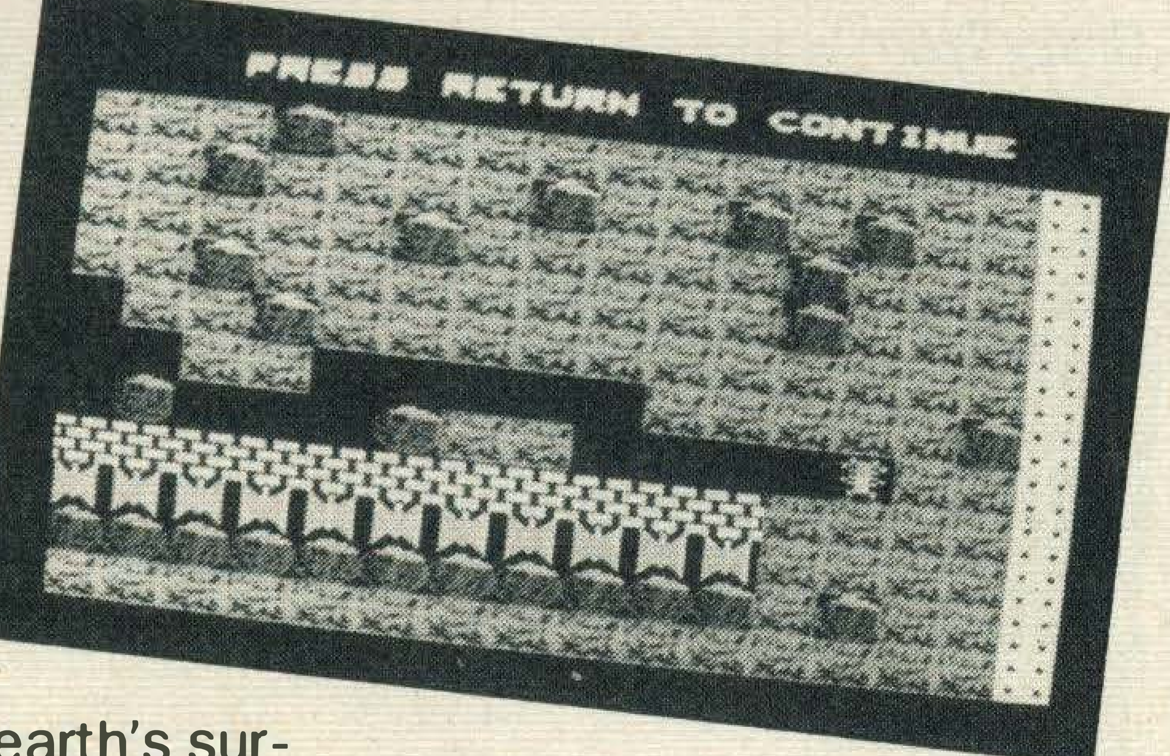
9

CASS: £6.95

Boulderdash — by Orpheus Software

CASS: £6. 95





Deep beneath the earth's surface lies a very unusual sort of mine and it's in these boulder strewn depths that the activity takes place.

You are guiding Rockford, a cute little character, round this mine with the express purpose of gathering points by collecting valuable objects such as diamonds.

Although this game has 16 different screens and up to 84 levels of difficulty, *Boulderdash* will still operate on a 32K MSX. The basic idea is to dig through earth blocks collecting enough diamonds to open the exit to the next screen.

Your movements are complicated by a tight time limit and the ubiquitous boulders which lie around. As Rockford drills down through earth, dislodged boulders tumble down in heaps, squashing him if he's still underneath — very nasty!

In some screens, strategy as well as speed must be employed. For example, in some screens deadly fireflies and butterfies can kill you if you haven't manoeuvred the boulders to fall on them first.

Each of the screens offer a different challenge; the diversity of maze scenarios and variety of creatures add spice and excitement to the game.

It is impossible to get bored with *Boulderdash* — so much is going on — and for a fun and addictive game costing the relatively low price of £6.95, it is hard to beat.

Introducing Fractions 2 — by Spectravideo

Fractions were first introduced in Mentor's original program, *Fractions 1*, and *Fractions 2* is really a continuation of the ideas explored therein.

Mentor, the original author of *Fractions 2*, describes this program as 'a collection of exercises designed to reinforce various aspects of fractions'.

First on the menu is a review of equivalent fractions. A definition is shown on screen together with a box of fractions. This resembles a pyramid structure due to the way that the fractions are displayed.

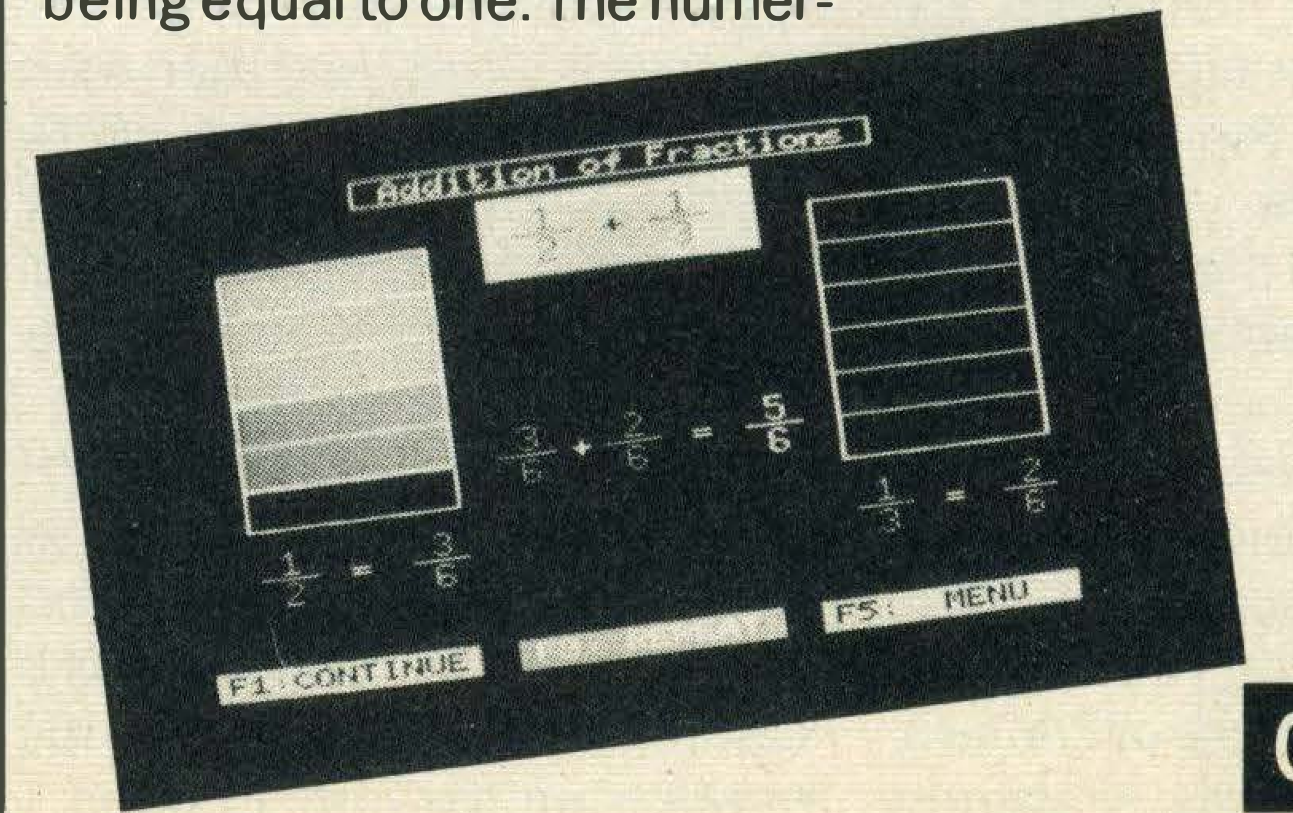
In addition to this diagram, the fraction 8/8 is shown as being equal to one. The numerator and denominator are also labelled.

In the following three exercises various aspects of fractions are explained.

Throughout the program, simple diagrams accompanied by crude sounds illustrate ideas as they are introduced. For instance, familiar objects such as a house with differently coloured curtains, toy soldiers, an apple tree and egg boxes are used.

To finish the program, four problems test how much the student has learnt.

Introducting Fractions 2 is aimed at the 10 to 14 age group and could be used as a back up to school work.



5

CASS: £7.95

Sky Jaguar by Konami

CART: £14.95





When *Space Invaders* made its first appearance on the video game scene, normally sane people became addicts overnight. *Sky Jaguar* could well inspire similar feelings in MSX users.

Sky Jaguar is your fighter aircraft and it's your task to fend off a mysterious invading fleet from the Zeifart nebula (the what?).

As you fly your fighter plane over a downwardly scrolling screen, the enemy appear from the top in waves. Altogether there are nine different types and each one has a unique set of fighting tactics.

Drinkas, the first set of enemies, are followed by ball-shaped black Balas, rotating Hammers, missle-shaped Twinbals, Hilakis, triangular Tranias, Cylods, Exbalis and finally the two-sided flapping Remaz.

It's a formidable line-up, especially as they drop indestructable white bombs. Fortunately, passing over POW symbols gives your ship extra firing capacity.

If you successfully negotiate the enemy onslaught you reach your goal — the enemy fortress. After its destruction, you return to the beginning, but this time enemies are even more cunning and devious.

Graphics are excellent and the realistic sound effects add extra tension to the game.

Sky Jaguar is brilliant — one of the best zap 'em flat games around.

Classic Adventure by Melbourne House

Adventures have alternately fired and frustrated player's imaginations since the first one — *Adventure* — appeared in 1978.

Classic Adventure is Melbourne House's version of this orginal adventure game, and it has added a few ideas and puzzles of its own.

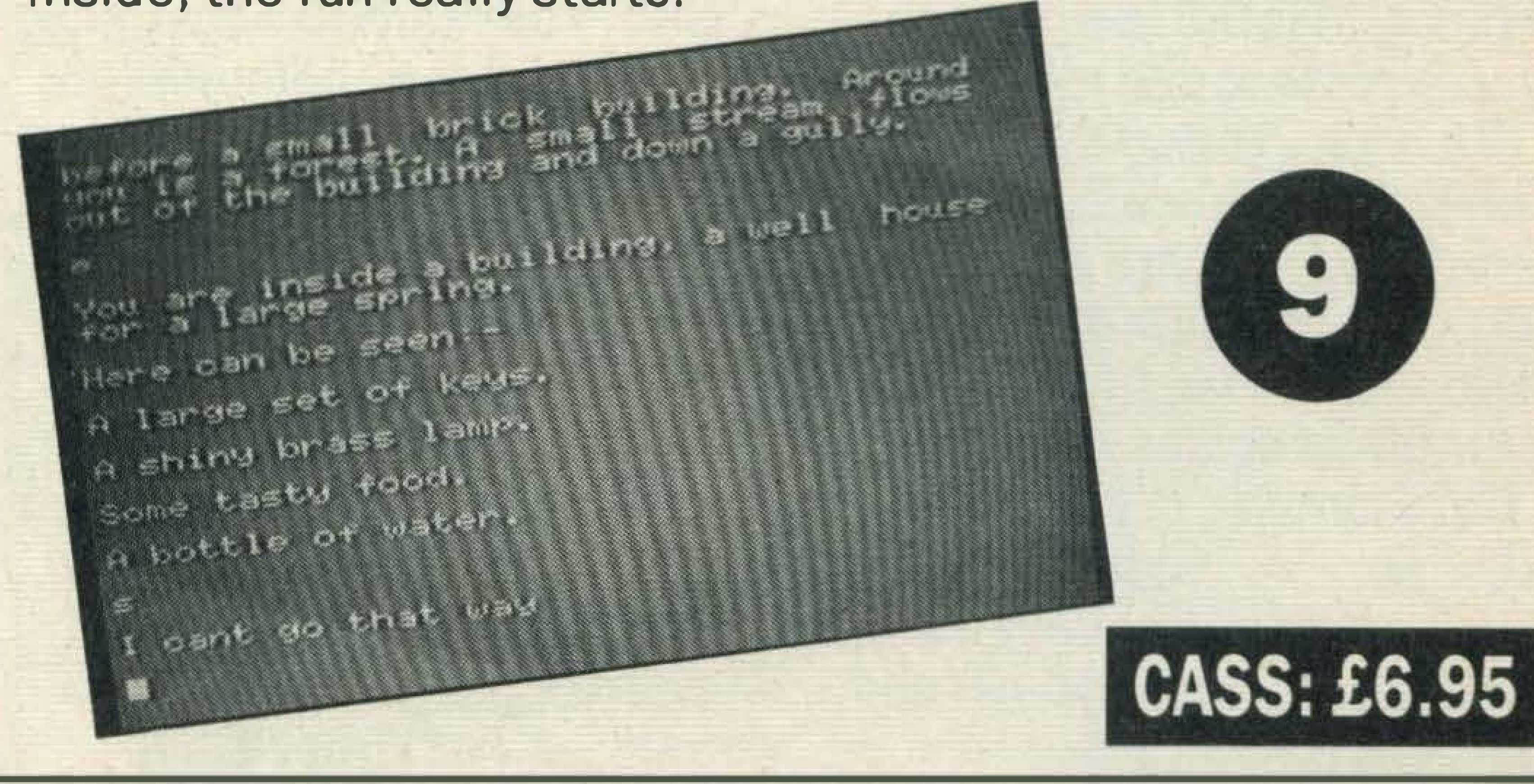
Most of the action takes place in a huge network of caves and caverns, but you start off in a forest beside a building — seemingly nowhere near any caves.

Eventually, a combination of imagination and luck will lead you into the magical world of the underground and once inside, the fun really starts.

Dirty broken passages, cheese rooms filled with holes, tiny beanstalks gasping 'water . . . water', are just some of the locations and objects to be found in this unpredictable game.

Mapping your progress is vital as it's very easy to get lost in the endless maze of passages. It is a text adventure and the place descriptions must be examined closely for vital clues and directions.

Classic Adventure is a great version of the original adventure game. Priced at £6.95, it is excellent value and is a worthy addition to any player's software library.



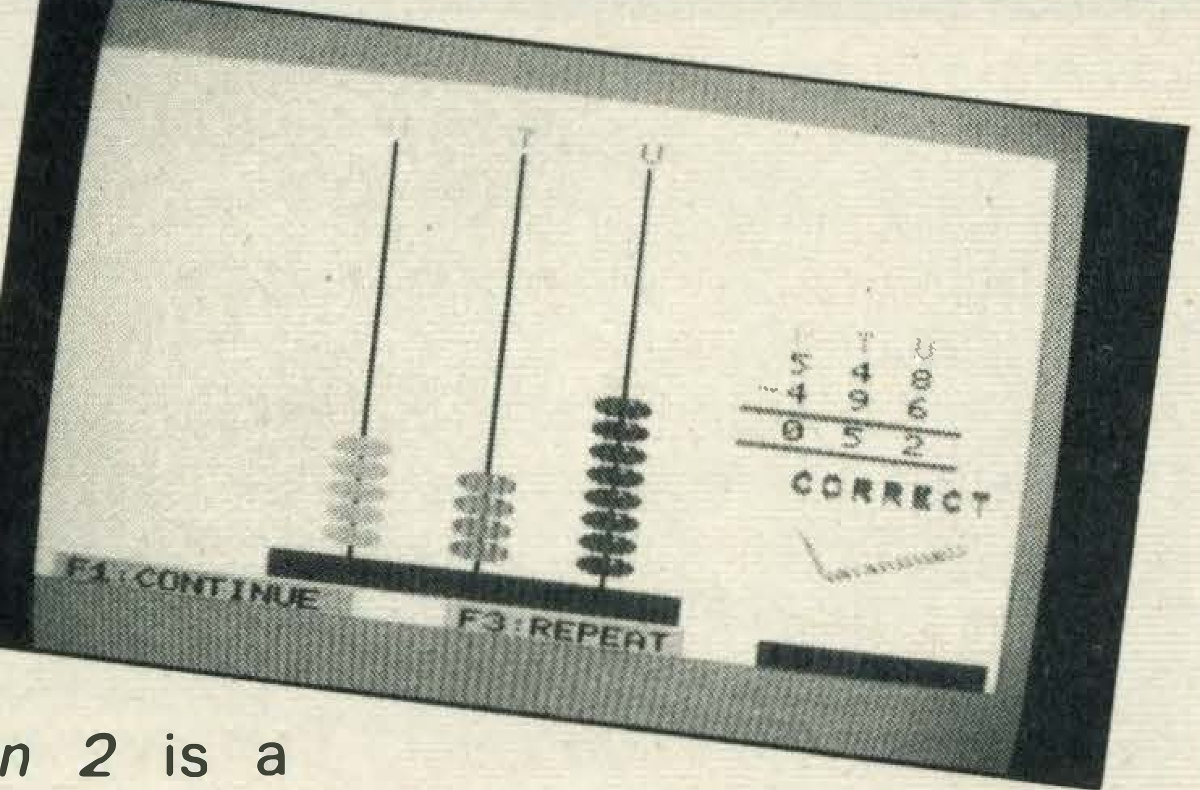
9

CASS: £6.95

Simple Subtraction 2 by Spectravideo

CASS: £7.95





Simple Subtraction 2 is a continuation of Mentor's other two mathematical programs, *Subtraction 1* and *Tens and Units*, and assumes that the user already knows and understands the concepts introduced in those two programs.

It is written for seven to ten year olds and is intended to further a child's knowledge of the three number groupings; units, tens and hundreds.

The program is divided into eight exercises. The first is called 'what is a number?', and displays an abacus with a few counters. The user is expected to type in the numbers shown there.

Most of the exercises deal with subtracting large numbers. In each exercise, an abacus is prominantly displayed in the middle of the screen and, beside it, a subtraction sum is set out.

By using the abacus, the child should be able to complete the sum and type in the answer. Huge ticks and crosses make it fairly obvious if the answer is right or wrong.

Five problems test how much the student has learned. A pair of unbalanced scales contain a subtraction sum on one side and the idea is to balance the scales by inserting the right answer on the other side.

Colours and crude sounds are used where possible to jazz the program up and, if used carefully, it will probably help children with subtraction.

Computer Billiards by Sony

This is billiards as you've never seen it before, with all the excitement of Hurricane Higgins potting yet another black.

It looks fairly simple, but don't let that deceive you into thinking it's going to be a cinch to play. Putting the balls into the pockets is hard work.

On screen, a green baize table is displayed together with the six numbered balls, a white cue ball, and a little white indicator dot.

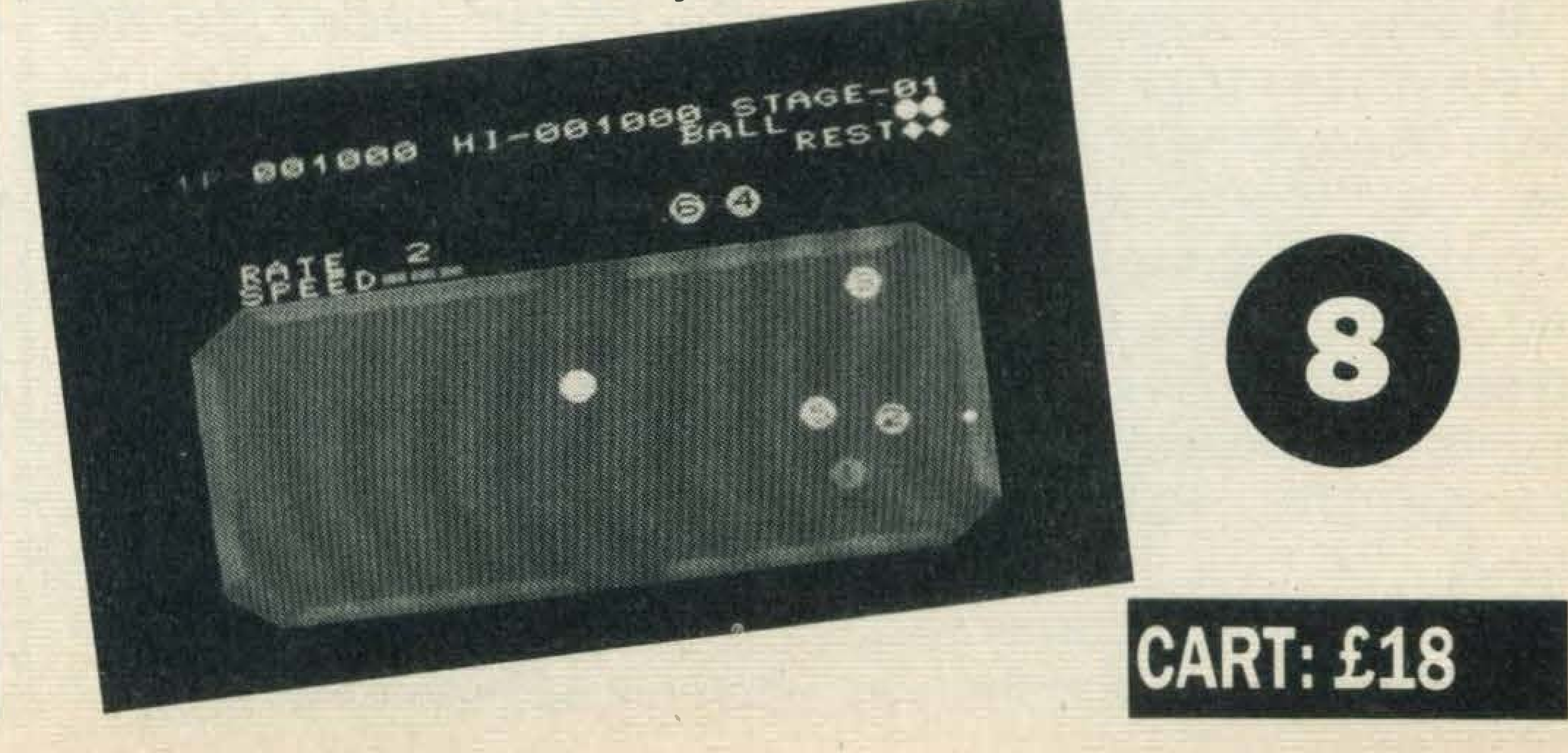
To line up a shot, you move the indicator dot around the edge of the table. The dot has to be placed so that the ball you intend to pot is between it and your cue ball.

It's also important to ensure that the part of the ball you want to hit is on a direct line between these two. The strength of the ball can be varied from a scale of one to three.

The ball responds smoothly and accurately to your hit and the graphics, although simple, are very good.

Scoring points is the aim and if you manage to get the balls in one after another, your scoring rate will go up dramatically. If you miss a ball three times in a row, you lose a life — as in Pool.

Computer Billiards is one of the most popular games in our office and despite its apparent simplicity, it will entertain for hours.



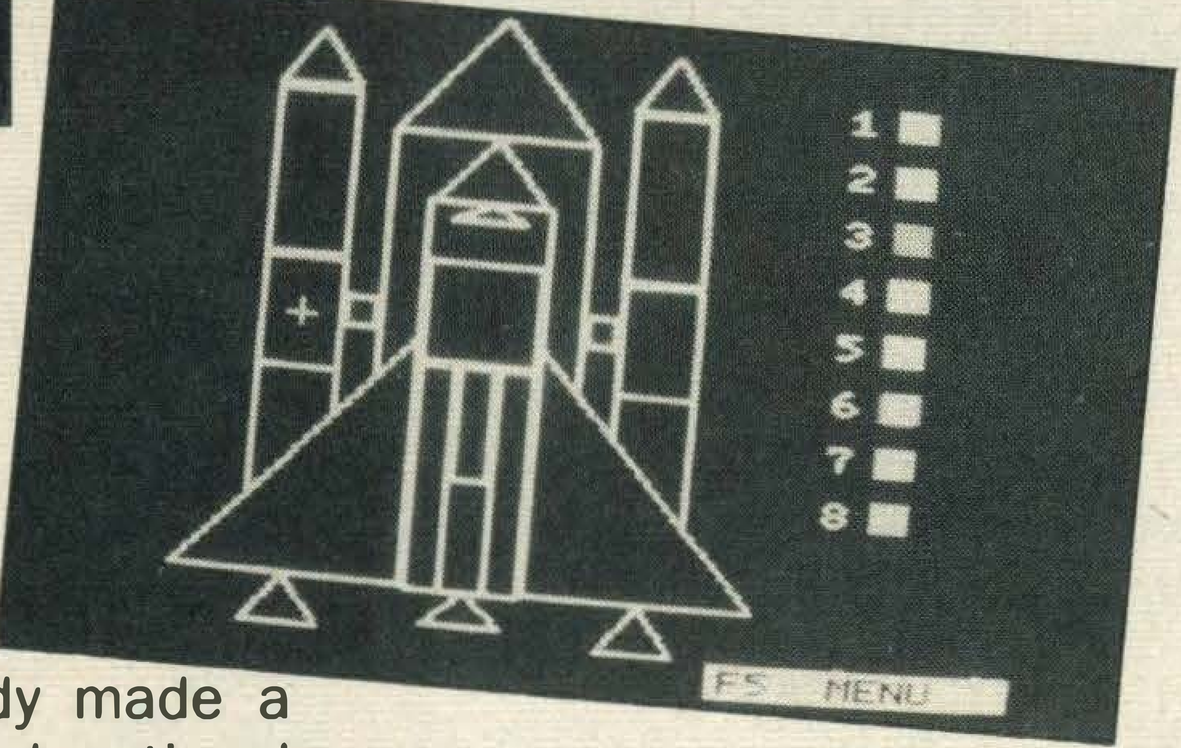
8

CART: £18

Introduction to Shapes — by Spectravideo

CASS: £7.95





Mentor has already made a large number of educational programs and is fast establishing itself as one of the major producers of educational software.

Introduction to Shapes is part of a trio of programs and is intended for seven to ten year olds. However we can't help thinking that the ideas are too simple for that age range.

Squares, triangles, circles and rectangles are the shapes introduced and are presented with colourful graphical illustrations and the sporadic use of tuneless noises.

For example, in the squares exercise, a square house appears and is gradually decorated with square windows and chimney.

In triangles, a drawing of a road crossing complete with triangular decorations flashes up. At this point the Mentor programmers seemed to have lost interest with the program because the illustration for circles is the same.

Finally, three colouring-in exercises test the child's knowledge. A rocket, train and robot outline made from the four shapes appears and before filling in colours, the shape has to be identified first.

Mentor has done what it set out to do, introduce the shape concept, but there really isn't enough work in the program to warrant a £7.95 price tag.

Fairy — by Morwood

With a name like *Fairy* you'd expect a game to be pretty naff, but to our surprise, it turned out to be unusual and amusing.

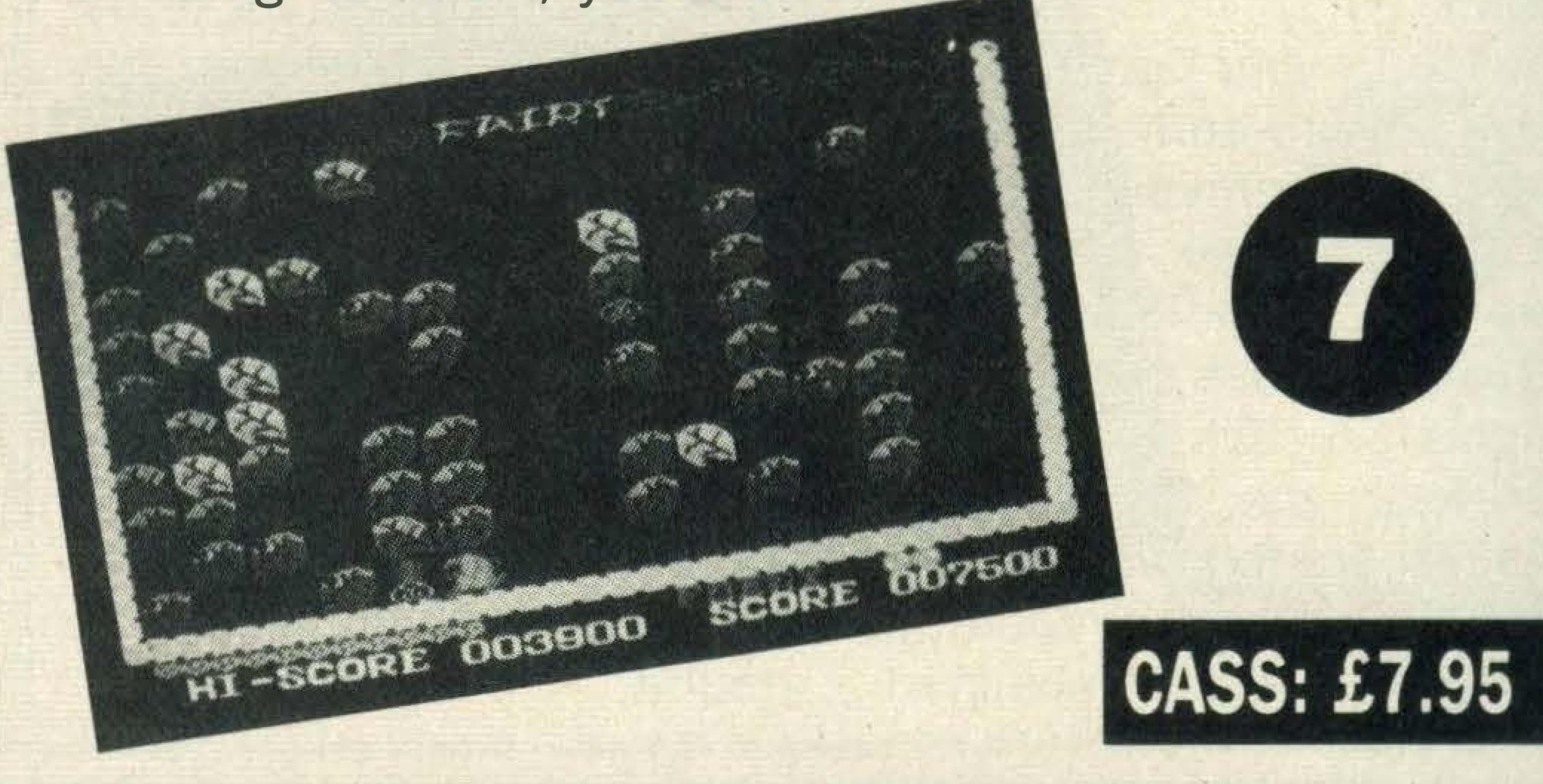
Killing caterpillars is the theme of the first level. They lie under a mass of leaves and cast as a fairy, the idea is to move around the screen placing white pots in front of the caterpillars. These pots apparently exhude immense attraction for caterpillars because they crawl inside and suffocate.

Once they are all dead, you move onto the second stage and find yourself doing battle with rats in a very dark room. Fortunately, a torch is provided and using its beam, you are expected to catch the rats in the light and knock them senseless with a slipper.

It takes some getting used to, but you'll soon get the knack.

Eight large spiders and 15 poles confront the player in the third screen and again the slippers come in handy as it is necessary to throw them at the spiders. They don't like it of course and spin sticky webs to try and stop you.

Once past this stage, you get onto a screen where the fairy is in severe danger of being snapped up by yet another caterpillar. Snails laying their spore present problems too.



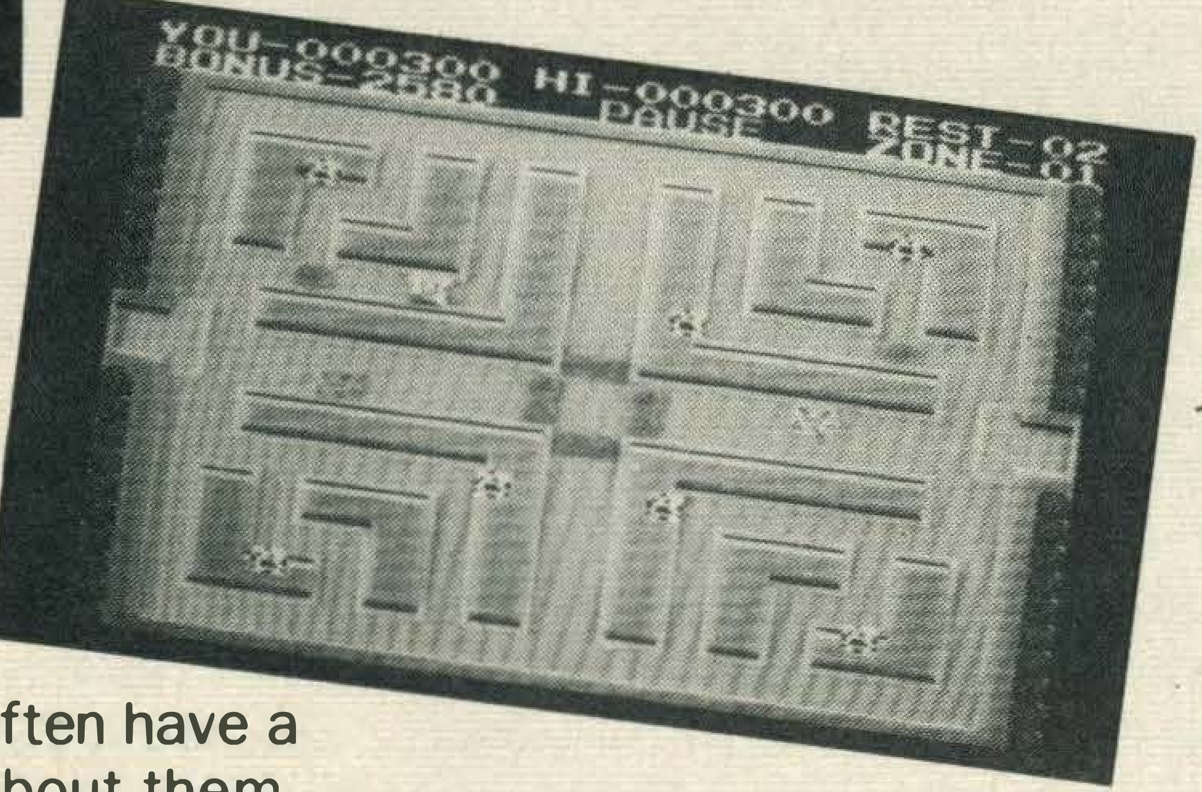
7

CASS: £7.95

Mopiranger — by Konami

CART: £14.95





Japanese games often have a certain cuteness about them. In this maze-type arcade game, you have to rescue little Moplits, held by galactic kidnappers called Razons (who makes up these names?) in their underwater castle. You are Mopyland's superhero, Mopy Ranger.

Moplits are trapped in the screen mazes and the idea is to move Mopy Ranger alongside the moplits to free them.

Razons are out to thwart you and touching one is fatal. A stone beamer is your only means of defence and it can change the Razons into stones.

Tidal flows are another factor to consider — they can slow down or speed up Mopy Ranger's movements.

Points are scored for clearing a screen without a stone beam, freeing Moplits, turning Razons into stone and completing a screen within the time limit.

On higher levels, the Big Razon appears and it has the power to dissolve stones.

Pips and beeps make up *Mopiranger's* sound effects and graphics are well up to Konami's usual excellent standard.

As arcade games go, this one is more strategic than many. If you like puzzles, it will become addictive.

Adventure Quest — by Level 9

Adventure Quest is the second game in the popular trilogy of middle earth adventures and bears many similarities to *Colossal Adventure*, the first game.

If you've already seen *Colossal Adventure*, you'll know that you are faced with yet another epic journey travelling through more than 200 locations, fighting fearsome foes and solving puzzles.

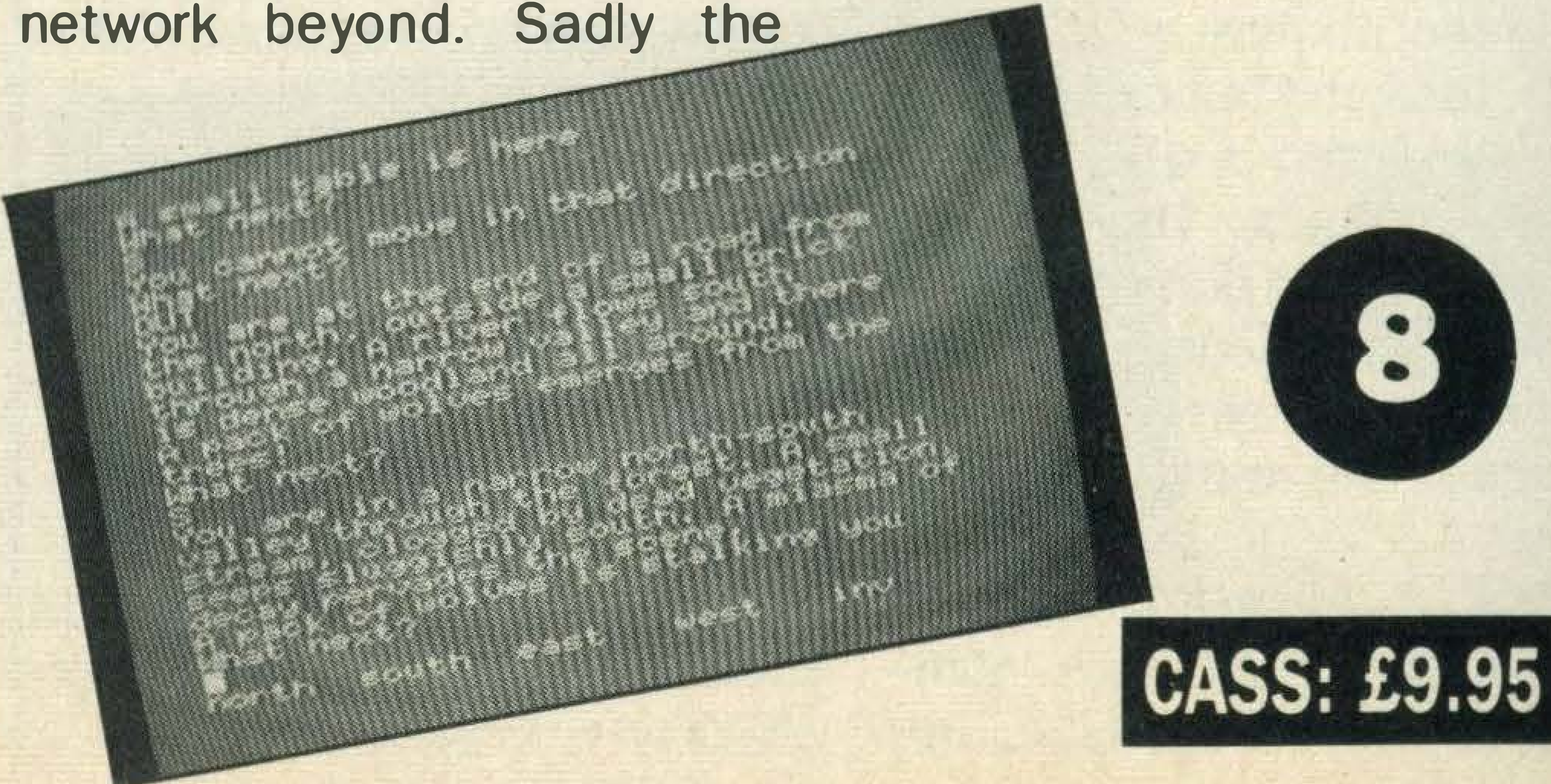
Time has passed since the first game, but you still begin in the familiar spot outside a building containing a well.

Ah-ha, the adventurer thinks, GET ALL and head for the brass grating, let's see what happened to the old cave network beyond. Sadly the grating is cemented over . . . curses! Yes, the sequel is just as frustrating.

The tale is typical middle earth fodder, you being the hero called upon to defeat the Demon Lord who's threatening your peaceful lands with nasty armies from the north.

So far we've found a silver ball up an oak tree, been mauled to death, died of thirst in the desert, been accosted by a djinni and found two white dots.

It's going to be a long hard battle, but then Level 9 games are seldom easy, and this one is presented in the usual professional manner. Another must for adventure players.



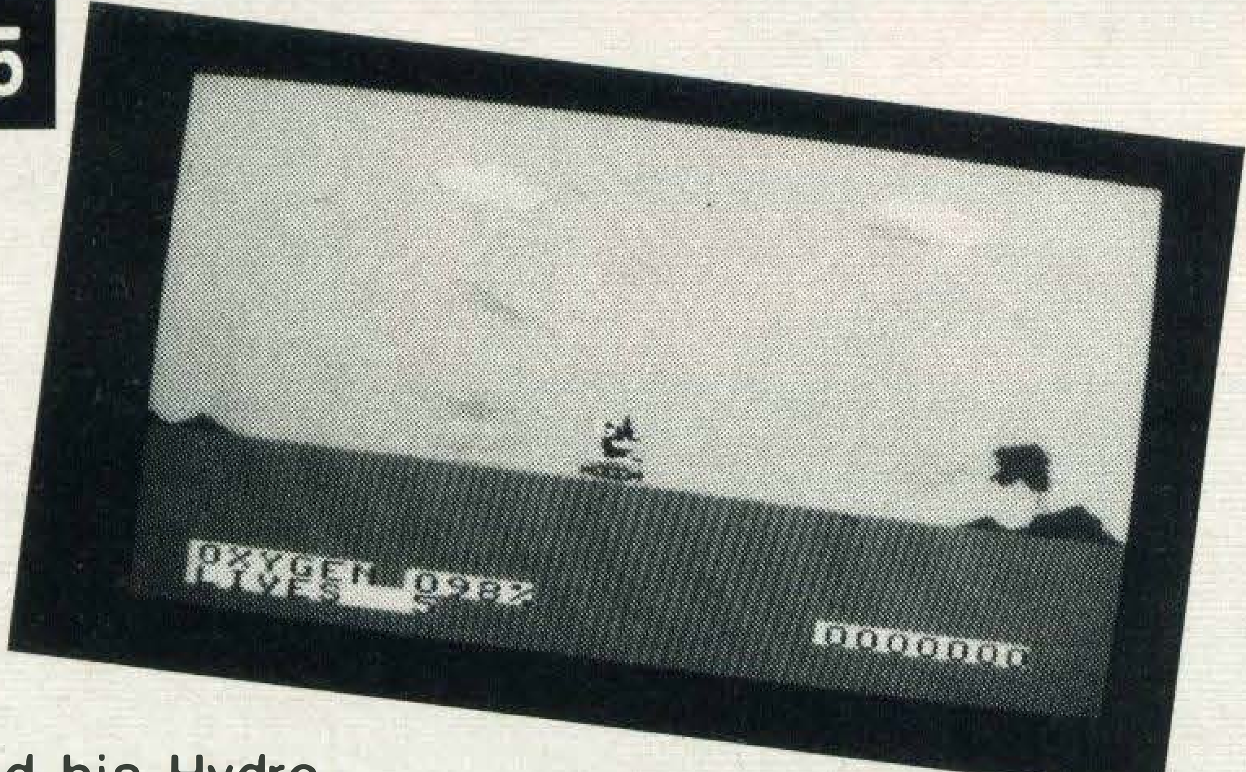
8

CASS: £9.95

Sea Hunter — by Spectravideo

CART: £14.95





Felix Freebyte and his Hydro-Hovercraft have set out on a dangerous fishing trip. Wild red ducks and manic fish are his prey, but it seems more likely that he'll end up being their supper.

He starts off with five lives and each one is supported with 100 per cent oxygen supply. This acts as a time limit as one per cent is deducted for every second in the game. Why Felix should need oxygen when he's standing on land is anyone's guess.

On level one, red birds swoop onto the screen from both sides and the aim is to shoot 25 birds without losing a life.

On the second level, he moves underwater to fight killer barracudas. The birds wreak revenge by dropping explosive eggs from above.

This time, 25 fish and five birds have to be shot with one life — a virtually impossible task as you aren't given enough movement and shooting capacity.

Level three repeats the process except that the eggs are dropped at a faster rate.

Sea Hunter is not one of the best games around, the graphics are amateurish, it's difficult to get a good score and even though it is available on cassette for £6.95, we expect much more of a game for the price.

Colossal Adventure — by Level 9

One of the first adventures to appear for the MSX is, appropriately enough, the one that started it all several years ago, known then as *Adventure*, and converted now in Level 9's usual impeccable style.

This is text-only, and text at its best, complete with room descriptions of lengthy purple prose.

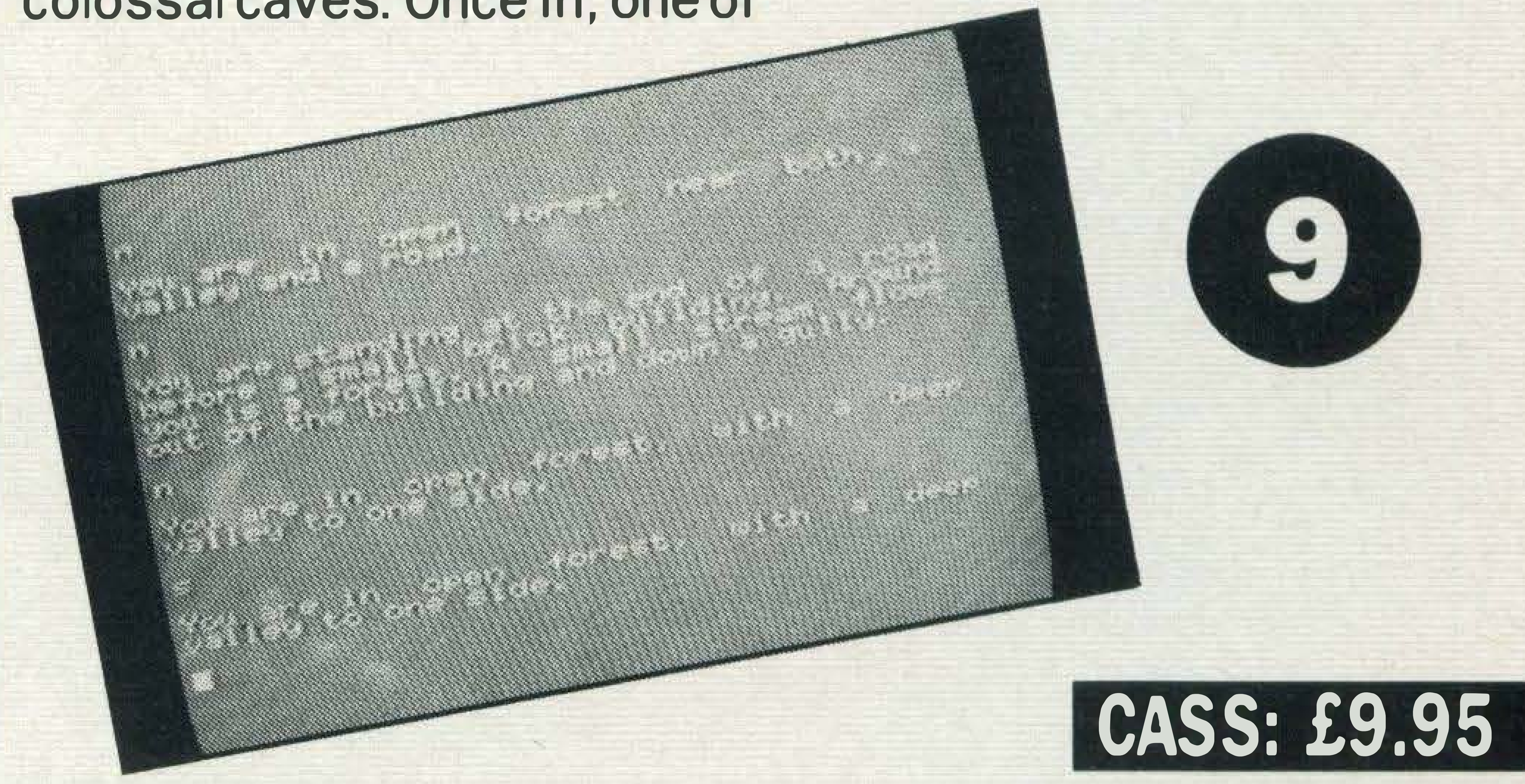
The quest, as ever, is to hunt for treasure, and you begin the adventure outside a small brick building in a wooded landscape.

There is quite a lot to explore in the surrounding landscape, but the game only really takes off once you're inside the colossal caves. Once in, one of the first problems you face is a hissing green snake that blocks your progress.

Once past, an amazing network of caves with over 200 locations opens up to you, complete with trolls, mazes, pirates and, naturally, oodles of treasure . . . if you can get it out again.

Response time is quick as Level 9 utilises its special A-code programming language, and as usual the game is well-packaged.

Level 9 is the number one software house for adventures, and this is the number one title. MSX owners start here.



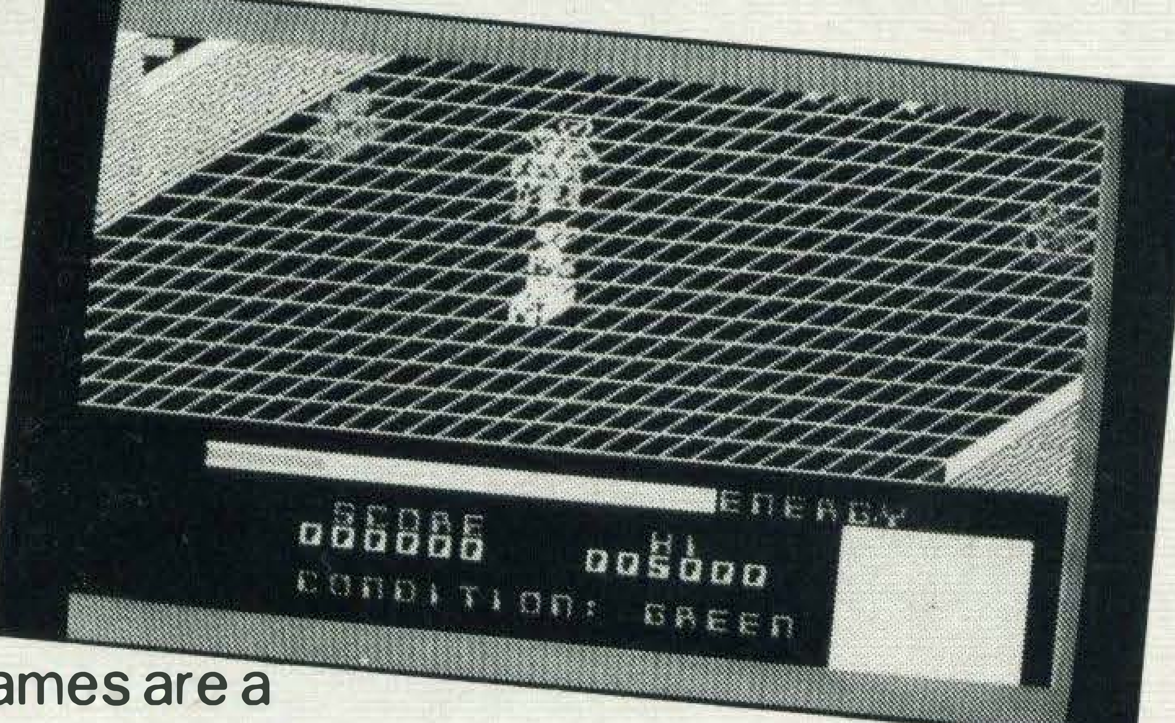
9

CASS: £9.95

Computer Hits — by Beau Jolly

CASS: £6.95





Bargain computer games are a rarity, but we think we've found one; *Computer Hits* by Beau Jolly. It is a compilation of six games, all popular in their own right, costing £6.95.

First on the tape is Martech's *Brian Jacks Superstar Challenge* which we're reviewing elsewhere in this section.

Disc Warrior is next up, an unusual arcade adventure from Alligata. By moving a man around a grid full of nasty enemies, you have to collect objects and destroy a computer complex.

Pool addicts will appreciate the inclusion of Bubble Bus's *Hustler*. There are six different variations, the general idea being to hit balls into the pockets of a pool table.

Chuckie Egg from A 'n' F Software is an addictive platform game, an office favourite in fact. You have to rush around eight screens collecting eggs and corn whilst avoiding rabid hens.

The most confusing game is PSS's *Les Flics*, an arcade game starring *Pink Panther* characters. The aim is to recover a diamond.

Lothlorien's *Special Operations* has you in charge of a group of commandoes trying to sabotage a weapons research centre.

There you have it, a varied collection of entertaining games for £6.95. Don't get crushed in the rush to buy it!

Castle Combat — by Spectravideo

An evil gloom has fallen on the galaxy since the rapid proliferation of the Tyrons who, we are told in the blurb, are 'the most wicked elements ever to scare the face of the earth'.

In your capacity as a space fighter, you are sent off in Star Duster to rescue the Galactic castle from its present occupation by the Tyrons. It all sounds exciting, but unfortunately this cartridge game is a bit of a disappointment.

We've come to expect brilliant graphics, a wide range of changing scenarios and snappy musical tunes from cartridge games. So it came as a shock to find that *Castle Combat* has none of these qualities.

There are only two different screens in the game; the scene outside and the one inside the castle.

Before entering the fortress, you have to shoot three types of attacker. Shooting capacity is limited due to the very crude programming, and occasionally the bullets pass straight through the enemy.

Once inside the castle, the aim is to make your way through the gaps in three walls, killing enemies on the way. An extra life is awarded if you make it to this level, but that is about the only sophisticated part of the game.



4

CART: £14.95

FLASH LOADERS



We round up three extra special data recorders. See how they run

A data recorder is a useful if not vital peripheral for your MSX, but how can you be sure that you're buying a quality machine and getting value for your hard-earned money?

To help you out we have cajoled several manufacturers into lending us their recorders. We hope to give you a better idea of what's available, what features to look out for and how much you can expect to pay.

We have chosen some models at the slightly more pricey end of the market — machines which have more inbuilt features specifically for data recording, and which will more easily stand up to the rigours of everyday computer usage.

Sanyo

The Sanyo DR202, successor to the DR101, has been on the market for some time. Peter Mitchell-Jubb, Sanyo's UK engineering manager, tells us that it's selling well. 'The DR202 is a more sophisticated and up-market model than the DR101,' he says. 'It is aimed at the more 'serious' computer user.' After using the machine we certainly go along with that — we'd be quite happy to keep it in the office indefinitely!

The DR202 looks very professional in its cream plastic casing with slate grey controls. Situated on the front of the machine is the usual TAPE counter and RESET button plus the essential SAVE, LOAD, REWIND, FAST FORWARD and STOP/EJECT buttons. To the left of these are the PHASE, MONITOR, SAVE and volume controls.

Further over to the right of the unit is an additional button labelled ADSS which stands for Automatic Data Search System. This feature is useful if, like us, you tend to save several programs on the one tape. It saves you spending all that time trying to locate a particular program.

Say you wanted to load the third program on your tape. You simply press the LOAD button (which will light up the load indicator), press the ADSS button three times then press the FAST FORWARD/ADSS (or REWIND/ADSS) buttons to locate the required section.

When the data recorder reaches the third program on the tape the appropriate light will come on to indicate that it has been located.

Peter Mitchell-Jubb tells us that ADSS isn't a new concept; 'It is an off-shoot of our Automated Music Selection System (AMSS) that's built into our music cassette recorders. Incorporating the facility into our data recorders was a natural progression'.

Another feature we particularly liked is that the EAR, REM and SAVE sockets have been colour coded with coloured plastic coverings, so that when you connect up your leads you don't have to remember which plug goes into which socket.

Philips

The Philips D6450 data recorder has been 'ergonomically' designed and it too is geared towards the 'serious' computer user.

The design is similar to the Sanyo — upright and boxy. The casing is a sophisticated graphite grey with chunky colour co-ordinated controls large enough for even the most ham-fisted.

On the left hand side of the machine is a TAPE counter and SAVE and DATA FLOW indicators. In the middle is the cassette flap and over on the right are the SAVE, PAUSE, LOAD/START, REWIND, FAST/FORWARD, CUE and STOP buttons.

Below these are switches for turning the monitor on or off, altering the PHASE control, and a sliding switch for adjust-



HISOFT

High Quality Microcomputer Software

Pascal (cassette only) £29.95

A powerful and virtually full implementation of Standard Pascal. A valuable educational and development tool in an incredibly small size (19K) for such a complete language compiler, compiles directly to Z80 code which executes very quickly, typically at least 40 times faster than the BASIC equivalent. INTEGERs, REALs, CHARs, ARRAYs, SETs, RECORDs, POINTERs, IF . . . THEN . . . ELSE, CASE . . . OF, WHILE . . . DO, REPEAT . . . UNTIL, FOR . . . DO, fully recursive procedures and functions, value and variable parameters etc. etc. So much that you will not believe it. You MUST write for details.

Devpac (cassette only) £19.95

An excellent, fast (4000 lines per minute) assembler coupled with a powerful disassembler/debugger. So many features that we cannot possibly do the package justice here – conditional assembly, assembly from tape, macros, screen and line editing, full arithmetic, front panel debugger with disassembler, single step, multiple breakpoints, modify, list and move memory etc. Everything you need AND fully relocatable so that it works on ALL MSX machines with more than 16K memory.

MSX Disc Software each £39.95

Devpac80

A suite of three programs for assembly language development:

ED80	is a powerful Wordstar compatible program editor; fully installable with help screens, cut and paste, search and replace, and other sophisticated features.
GEN80	is a fast, high-specification macro assembler with disc inclusion, conditional assembly and full arithmetic.
MON80	is a comprehensive debugger and monitor, including single-step, disassembly to disc, breakpoints, pattern search and much more.

Pascal80

A powerful and virtually full implementation of Pascal, producing fast Z80 directly (no P-codes or linking). There is full heap management by NEW, MARK and RELEASE and access to machine code via PEEK, POKE, INLINE, ADDR, INP, OUT and CPM. Among the compiler options are source file inclusions and runtime check disabling. ED80 is supplied with Pascal80 (see Devpac80 above).

C++

A fast compiler for the C systems language which invokes ED80 automatically when it finds an error. C++ has UNIX standard I/O including random access files and command lines with redirection. C is a very flexible language combining high-level structured programming with low-level access to the Z80. HiSoft C++ conforms almost exactly to the 'Kernighan and Ritchie' standard with the exception of floats. Again, ED80 is part of the package.

HiSoft, 180 High Street North, Dunstable, Beds. LU6 1AT Telephone (0582) 696421

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MSX

Please state name, address and order clearly.
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Overseas orders add £1.00 per game.
All cheques made to UNITSOFT.



ing the output signal. There's also a built-in speaker and an EJECT button.

On the back of the machine are the standard EAR, REM and MIC sockets which are coloured to match the cassette plugs on the lead.

The unit can be mains or battery run, but if you're going for the former you'll need an AC/DC mains adaptor with a DC 9V socket. This isn't supplied with the recorder.

This model doesn't have the ADSS system to locate programs on a tape, but you could use the tape counter or DATA FLOW indicator. This not only lights up during loading and saving, but also indicates, during the use of the CUE and REVIEW functions, whether data is actually present on the tape.

Failing that you can switch on the MONITOR. If data is present and you've got the volume high enough, you'll hear it!

A random selection of tape-based games and.a couple of listings sent in by readers all loaded into the Philips without any hitches. And as a further test we saved BASIC programs on the Sanyo and then reloaded them on the Philips. There were no problems — we didn't even have to alter the PHASE switch.

Ferguson

Ferguson's 3T31 model is totally different in shape and styling from the Sanyo and Philips data recorders. It looks more like a standard cassette recorder in its black plastic casing with toning grey and muddy-orange controls. This might explain why Ferguson has stuck a very large label in the top right hand corner to remind you that this is, in fact, a 'Ferguson Program Data Recorder'.

Unlike the other two models the Ferguson 3T31 has a POWER ON switch, which explains why we couldn't get the machine to work at first. Reading the manual first makes good sense.

The TAPE counter is tiny and almost invisable, and the RESET button seems to have been designed for pygmies.

On the bottom left hand section of the unit are two sliding controls — MONITOR Off/On and a LEVEL control. The latter controls the pitch of the signal.

Moving round to the back of the machine you'll find a built-in microphone and the EAR, REM and MIC sockets. There's an additional AUXiliary socket that can be used instead of the MIC, but the latter is preferable as it has the higher sensitivity to input than the AUX.

When loading and saving data we had to fiddle around with the LEVEL control until we hit the right setting. Our advice is that when you've worked out which is the right setting make a note of it for future reference.

The Ferguson stood up to usage and test loadings as well as the other two models. But you need to play around with the LEVEL control.

We do have two criticisms. The first is the design of the two sliding controls, which are so flimsy that they can easily be removed.

The second is the lack of a phase switch. There is a chance that a program loaded on another data recorder won't load into the Ferguson. Admittedly we had no problem there, but a phase switch would eliminate any possible future problems in this area.

When we asked about the AUX socket on the back of the machine, Ferguson was a bit vague as to its use. From the little we've managed to deduce from the manufacturer's leaflet it's superfluous.

Other than that it's a solid and reliable machine with a very attractive price tag for home micro users.

Opinion

None of the data recorders we looked at are capable of playing music cassettes — they are, after all, dedicated data recorders.

Because of its useful ADSS facility, we have to say that the Sanyo DR202 was our favourite.

Who would prefer to spend time listening for a program or watching the tape counter whizz round when, instead, you can use the ADSS and nip off for a quick cup of tea while it tracks down the program for you?

Having said that we also liked the boxy upright design of the Philips and the controls which, although not touch-sensitive, still have a nice feel and respond to very little pressure.

If you're on a budget, are likely to do some programming but are more interest in games playing, you're best bet is to go for the Ferguson. It is compact, has easy to use controls and offers lots of dedicated features for your £29.99.

Ultimately, buying a data recorder, or any peripheral for that matter, boils down to personal preference. The deciding factor can be price, but it can also be the presence — or absence — of the technical gadgets and widgets.

Don't buy a machine just because it looks good or it's on special offer — make sure that it has all the features you're likely to need and that it is covered by a manufacturer's warranty or guarantee.

Do shop around, though. Prices can vary dramatically from one retailer to the next, even for the same model.

Once you've bought your data recorder, don't skimp and buy a job lot of cut price cassettes. It's much better to pay a bit extra for a reputable brand and be confident that the tape will load properly and not lose all your programming masterpieces. ■

SPECIFICATIONS

SANYO DR202



Tape counter
Reset button
Save button
Automatic Data Search System Indicator
Automatic Data Search System button
Volume control
Monitor switch
Phase switch
Stop/Eject button
Fast Forward
Rewind switch
Load switch
Remote socket
Load socket
Save socket

Tape speed: 4.75cm/sec
Weight: 0.9kg
Dimensions: 200x80x145mm
Price: £44.95
Supplier: Sanyo, Sanyo House, 8 Greycaine Road, Watford, Herts.
Tel: (0923) 46363

FERGUSON 3T31



Tape counter
Indicator lights
Reset button
Save button
Volume control
Monitor switch
Power button
Stop/Eject button
Fast Forward
Cue/Review
Rewind switch
Load switch
Built-in monitor/speaker
Ear socket
Remote socket
Mic socket
Aux socket
Tape speed: 4.75cm/sec

Weight: 1.2 kg
Dimensions: 240x60x177mm
Price: £29.99
Supplier: Thorn EMI Ferguson, Cambridge House, Great Cambridge Road, Enfield, Middlesex.
Tel: 01-807 3060

PHILIPS D6450



Tape counter
Monitor On/Off switch
Save indictor
Data flow indictor
Stop/Eject button
Output signal control
Phase selector
DC 9V socket for AC/DC mains adaptor
Stop button
Rewind/Review
Fast Forward/Cue button
Load/Start
Pause button
Save Socket
Ear socket
Mic socket
Remote socket

Tape speed: 4.75cm/sec
Weight: 0.9kg
Dimensions: 210x160x115mm
Price: £38
Supplier: Philips Electronics, City House, 420/430 London Road, Croydon, Surrey CR9 3QR.
Tel: 01-689 2166

LISTINGS LOWDOWN

Before you type in those games, take a few tips from Steve Mansfield

Have you ever looked at the program listings in magazines and wondered whether they are worth the effort? Well, the listings section on the following pages contains some excellent software for nothing more than the price of a few hours spent typing them in. But beware — there is a catch for the unwary or careless typist.

Listings are valuable in many ways. For a start, they're a very cheap way to get software. And they're also highly educational in that they can teach you a great deal about programming.

Unfortunately, a lot of that learning comes as a result of hours spent getting the bugs out of programs which refuse to work. But that doesn't mean the listings themselves are faulty — on the contrary, most errors creep in at the typing stage, and can be all the more difficult to see for that reason.

Impatient or especially unlucky programmers are occasionally consumed with paranoia, believing that the micro or the program contains some evil entity, bent on draining their energy and wasting their time. But with care, and a knowledge of the common pitfalls, you can easily exorcise these demons.

It may sound obvious, but don't miss anything out. You'd be surprised how many people discard parts of a program because they don't look important.

Occasionally there may be just one part of a program — a graphics routine, say — which interests you. But even in well-structured programs, which are broken down into self-contained sections, the bit you want may rely on other parts to set up variables, screens, arrays and so on. So you should always start by typing in the whole thing.

Be very careful not to jump lines. Accidentally entering a line twice presents no problems, providing the same line number is used both times, as the second entry simply overwrites the first. But missing out a line is usually fatal, unless it's just a REM statement.

In case you haven't come across these apparently benign creatures before, REMark statements are harmless notes, put into a program to remind you what any particular section is doing. Anything following the REM statement is ignored by the computer when it's actually executing the program — they're just there to make the listings clearer.

Smart programmers use REMs to insert the date the program was written or updated, a summary of what it does, and any known bugs or peculiarities. This means that when you come back to a program after a break, having forgotten everything about it, you can understand it at once.

So REM statements don't actually *do* anything, and missing them out of a listing will make no difference at all to the functioning of the program. But these seemingly harmless creatures still have a way of getting at you.

The statements themselves can be omitted with impunity, but the lines that contain them might be essential. That's because those line numbers might be used in GOTO or GOSUB commands elsewhere in the program. Jumping to REM statements like this is quite common. If you remove the line the program will have nowhere to jump to, and so will crash.

When copying the program, use a ruler under the line you are reading, moving it down one line at a time. This should stop you mixing lines. If you're feeling a little more wealthy you could invest in a proper copy holder, like those used by

professional typists.

It's easy to confuse some of the characters. The classic case is to mix up the figure zero (0) with the upper case letter O. For that reason a convention was adopted in computer circles to put a slash through the zero. Not all printers do this, but we have adopted this style for listings in *What MSX?* So if there's no slash you can assume it's the letter, not the number.

A similar, if less common problem occurs with the number one and the lower case letter l. And if the program uses a slash, make sure it's going the right way. The standard oblique (/) is used as the division symbol, but the keyboard also has a reverse oblique (\). Don't mix them up.

What's more, MSX BASIC allows some commands to be tokenised — one symbol replacing a whole command. The most useful is the query (?) which you can type instead of PRINT. This shouldn't cause too much trouble. The one to watch out for is the single quote mark (') in place of REM. It's easy to miss altogether, and if you omit it the computer will try to interpret the text as a BASIC command — and invariably crash.

Watch out for graphics characters, too. The problem is that they don't always appear as such. Non-MSX printers can't cope with many of the special figures and shapes contained in the large MSX character set, and when a program is listed these characters often turn up as blanks or ordinary letters.

Having the wrong shape in a PRINT statement won't cause the program to crash. But it may make the screen look decidely odd and tempt you into thinking you've done something wrong. If this happens, experiment a little, putting your own choice of graphics characters into the PRINT commands.

Entering DATA statements is undoubtedly the biggest cause of programming heartache and frustration. Some programs, particularly games, make extensive use of DATA lines, holding hundreds of numbers and characters. It's all too easy to miss one item out, put an extra one in, mix up lines, repeat lines, and so on.

If there are too few items the program will crash with an 'Out of data' error message. You then have the laborious task of finding the missing item.

Sometimes it's not the item that's missing but the comma which should separate two. This can lead to other faults, such as 'Type mismatch' where the computer expects a number and finds a character string, or vice versa.

Rather than tediously checking every DATA item in your program with the original listing, simply count the number of items in each line. This can often lead quite quickly to a missing number.

Loops

If you are sure that the DATA statements are correct, but you're still getting an error, check the READ statement which takes in the data. This is often contained in a loop. Make sure this loops the correct number of times, paying particular atttention to where it starts — some loops run from 0, others from 1.

While on the subject of loops, these can cause trouble if you forget to close them. All FOR statements must have exactly the same number of NEXTs. Count them up, and if there's a difference you'll at least know what's wrong, if not where!

Sometimes the screen may look strange or untidy. That can happen when the program writer has assumed your computer will be in the default screen mode, the one the micro adopts when you first turn it on, with its normal white text on a blue background.

However, if you've been playing around with the screen modes, or have just finished running another program, you might wind up in a different mode, with an odd screen width and different colours.

If the program you're entering doesn't use graphics it might not contain a SCREEN command, so you could be in the wrong mode. What's more the new program, assuming that the screen colour is the normal blue, might also select a text colour which reacts horribly with the colour you've actually got in the background — or even choose the same colour, making the text invisible!

The answer to all this is simple. Always reset the micro before starting any programming. Use the RESET switch, if provided, or the main power switch.

Unless you're a complete masochist you'll want to SAVE the program you've entered on disk or cassette, so you can LOAD it easily next time. But don't wait until you've finished to do that. Instead SAVE the program every 15 minutes or so. In that way, if you accidentally kick out the mains lead you still have most of the program safely stored.

You should also make sure the program is SAVED before trying it out. This is especially true of those programs which send data to a printer or other peripheral. If the peripheral isn't connected, or you've forgotten to turn it on, the micro can hang up completely. You then have no choice but to turn it off — at which point you can wave goodbye to your program.

Sometimes the demons might originate outside the micro. Electricity Boards are ace program wreckers, with power surges or, much more commonly, momentary power failures. Even a brief interruption is enough to wipe out or badly corrupt your program — another good reason to SAVE regularly.

As you can see, there are plenty of opportunities to make mistakes. But take heart—you probably won't make more than two or three, and with care you will have your programs up and running in no time. ■

D-I-Y GAMES

If you've bought your MSX, had a read through the first ten pages of your manual, and are wondering what to do next, here's the answer, courtesy of reader Cliff Walters.

We have games listings for you to type in and run for yourself. They're all fairly simple, straightforward BASIC programs, and shouldn't present too much difficulty.

Typing in listings is one of the best ways to get to grips with a programming language, learning for yourself the kind of routines and shortcuts that other programmers have found useful. So get typing!

FROGGER

This is a particularly colourful version of the famous arcade game, with plenty of variation on-screen. Machine code has been used in parts to move everything about as BASIC is just too slow. The white frog isn't too impressive, but it is just about the only colour that will show up on such a colourful background. Each time you successfully negotiate five frogs home, you move onto the next, faster screen. By the time you reach screen 10 you are at maximum speed.

```
10 REM *********************
20 REM **  M.S.X  FROGGER  **
30 REM ** BY CLIFF WALTERS **
40 REM **  MARCH-MAY  1985 **
50 REM ** ON SPECTRAVIDEO. **
60 REM **      SVI  728    **
70 REM *********************
80 CLEAR 500,&HEA2E
90 ON STOP GOSUB 2130:STOP ON
100 CLS:KEYOFF:GOSUB 2050
110 N=RND(-TIME):GOSUB 1500
120 SCREEN 1,2:COLOR 14,1,1:WIDTH 32
130 DEF USR0=&H41
140 DEF USR1=&H44
150 DEF USR2=&HEA2F
160 DEF FNA(X)=INT(RND(1)*X)+1
170 GOSUB 830:GOSUB 1700:HI=0
180 LE=1:SC=0:Z=100
190 FL=0:FH=0:LI=5
200 CLS:PRINT:PRINT:PRINT"FROGGER LEV
EL":PRINT
210 FOR I=4 TO 19:PRINT SPC(I)LE:NEXT
 I
220 LOCATE 0,21:PRINT"SCORE=";SC
230 GOSUB 1460:GOSUB 820:GOSUB 820
240 U=USR0(0):CLS:LOCATE 0,0:PRINT"SC
ORE";SC:LOCATE 13,0:PRINT"HI=";HI:LOC
ATE 24,0:PRINT"LIVES";LI
250 LOCATE 0,1:PRINT STRING$(32,216):
:LOCATE0,2:PRINT"bbb`abbbb`abbbb`abbb
b`abbbb`abbb";
260 LOCATE 0,3:PRINT STRING$(32,145)
270 FOR I=3 TO 27 STEP 6:LOCATE I,3:P
RINT SPC(2):NEXT I
280 LOCATE0,4:PRINT STRING$(128,147)
290 LOCATE0,8:PRINT STRING$(32,144)
300 LOCATE0,9:PRINT STRING$(32,98)
310 LOCATE0,10:PRINT STRING$(32,131)
320 LOCATE0,11:PRINT STRING$(32,128)
330 LOCATE0,12:PRINT STRING$(32,130)
340 LOCATE2,14:PRINT I$
350 LOCATE0,16:PRINT STRING$(32,129)
360 LOCATE0,17:PRINT STRING$(32,130)
370 LOCATE0,19:PRINT I$
380 LOCATE0,21:PRINT STRING$(32,129)
390 FOR I=6848 TO 6879:VPOKE I,136:NE
XT I
400 FOR I=6880 TO 6911:VPOKE I,98:NEX
T I:SP=0:M=0
410 X=16:Y=22:PUTSPRITE 1,(X*8,Y*8),1
5,4
420 ON SPRITE GOSUB 810:SPRITE ON
430 IF M=1 THEN 490
440 LOCATE0,4:PRINTA$:LOCATE0,5:PRINT
B$
450 LOCATE0,7:PRINTC$:LOCATE0,6:PRINT
D$
```

```
460 LOCATE0.13:PRINTE$:LOCATE0.15:PRI
NTF$
470 LOCATE0,18:PRINTG$:LOCATE0.20:PRI
NTH$
480 U=USR1(0)
490 FOR D=1 TO Z:NEXT D
500 U=USR2(0)
510 PUTSPRITE0,(SP,66),15,SP MOD 2+1
520 SP=SP+5:S=STICK(0)
530 X=X+(S=7 AND X>0)-(S=3 AND X<31)
540 IF S=1 THEN Y=Y-1:PUTSPRITE 1,(X*
8,Y*8),,7:SC=SC+10:LOCATE 5,0:PRINTSC
550 PUTSPRITE 1,(X*8,Y*8),,4-(S=3)+(S
=7)
560 IF VPEEK(Y*32+X+6144)>146 THEN 81
0
570 IF Y>3 THEN 490
580 IF VPEEK(Y*32+X+6144)<>32 THEN 81
0
590 IF X=4 OR X=10 OR X=16 OR X=22 OR
 X=28 THEN X=X-1
600 PUTSPRITE 1,(-16,0):LOCATE X,Y-1:
PRINT"cd":LOCATE X,Y:PRINT"ef"
610 SC=SC+100:LOCATE 5,0:PRINTSC
620 PLAY "T255L64O3C64O4C64O5C64O6C64
"
630 FH=FH+1:IF FH=5 THEN 720
640 M=1:GOTO 410
650 FOR I=1 TO 5:PUTSPRITE1,,FNA(15),
3
660 FOR DL=1 TO 30:NEXT DL
670 PUTSPRITE1,,FNA(15),6
680 FOR DL=1 TO 30:NEXT DL,I
690 PUTSPRITE 1,(-16,0):LI=LI-1
700 LOCATE 29,0:PRINT LI:IF LI=0 THEN
 750
710 M=1:GOTO 410
720 GOSUB 820:SC=SC+1000:LE=LE+1:PUTS
PRITE 0,(-16,0)
730 Z=Z-10:IF Z<=0 THEN Z=0
740 GOTO 190
750 IF SC>HI THEN HI=SC:LOCATE 16,0:P
RINTHI:FL=1
760 GOSUB 820:PUTSPRITE 0,(-16,0):CLS
:PRINT:PRINT:PRINT SPC(6)"YOUR SCORE
WAS";SC:IF FL=1 THEN 780
770 IF FL=0 THEN LOCATE 8,7:PRINT"HI
SCORE=";HI:GOTO 790
780 PRINT:PRINT:PRINT:PRINT SPC(4)"A
NEW HI SCORE OF";HI:FL=0
790 LOCATE 1,20:PRINT"PRESS SPACE BAR
 TO PLAY AGAIN"
800 IF NOT STRIG(0)THEN 800 ELSE 180
810 SPRITE OFF:PLAY "T255L64O6C64O5C6
4O4C64O3C64O2C64":GOTO 650
820 FOR DL=1 TO 750:NEXT DL:RETURN
830 LOCATE 8,20:PRINT"ONE MOMENT PLEA
SE"
840 RESTORE 880
850 FOR I=1 TO 7:SP$="":READ S$:FOR B
=1 TO LEN(S$) STEP 2
860 SP$=SP$+CHR$(VAL("&H"+MID$(S$,B,2
))):NEXT B
870 SPRITE$(I)=SP$:NEXT I
880 DATA 00000C3FF3C000000000000000000
00000000C0B0E0000000
890 DATA 00000C3FC3000000000000000000
00000000000C3BFEC00000
900 DATA C2251C7E7E1C25C2
910 DATA 81995A3C3C7E9942
920 DATA 43A4387E7E38A443
930 DATA C3E77E24247EE7C3
940 DATA 004281995A3C3C3C182424424224
0000
950 C=0:READ A:IF A=999 THEN RETURN
960 READ C$:FOR B=1 TO LEN(C$) STEP 2
970 VPOKE A*8+C,VAL("&H"+MID$(C$,B,2)
):C=C+1:NEXT B
980 GOTO 950
990 DATA 33,0000009900000000
1000 DATA 40,3C7EFFE7E7FF7E3C
1010 DATA 96,FFF0C08080000000
1020 DATA 97,FF0F030101000000
1030 DATA 98,FFFFFFFFFFFFFFFF
1040 DATA 99,FFF1D993950B0F07
1050 DATA 100,FF0F9BC9A9D0F0E0
1060 DATA 101,0703070D0C384400
1070 DATA 102,E0C0E0B0301C2200
1080 DATA 104,3F535C8B8C535C3F
1090 DATA 105,FF33CC33CC33CCFF
1100 DATA 106,FC32CE33CD32CEFC
1110 DATA 112,3F535C8B8C535C3F
1120 DATA 113,FF33CC33CC33CCFF
1130 DATA 114,FC32CE33CD32CEFC
1140 DATA 120,187E7EFFFF7E7E18
1150 DATA 128,8181FF8181FF81FF
1160 DATA 129,FFFF000000000000
1170 DATA 130,000000000000FFFF
1180 DATA 131,0000000000000000
1190 DATA 136,000044D26EEEFFFF
1200 DATA 144,000044D26EEEFFFF
1210 DATA 145,FFFDBE2934440000
1220 DATA 146,815A3C7E7E3C5A81
1230 DATA 147,0000000000000000
1240 DATA 184,FF80BFBFBFBF80FF
1250 DATA 192,077EF3F3F3F37E07
1260 DATA 193,F83EE7E7E7E73EF8
1270 DATA 194,E02EBDB9B9BD2EE0
1280 DATA 195,78337FCECE7F3378
1290 DATA 196,008EE43F3FE48E00
1300 DATA 197,0775BDBFBFBD7507
1310 DATA 200,E04779F9F97947E0
1320 DATA 201,7EFFF7F7F7F7FF7E
1330 DATA 208,077EF3F3F3F37E07
1340 DATA 209,F83EE7E7E7E73EF8
1350 DATA 210,E02EBDB9B9BD2EE0
1360 DATA 211,78337FCECE7F3378
1370 DATA 212,008EE43F3FE48E00
1380 DATA 213,0775BDBFBFBD7507
1390 DATA 216,DFDF00FBFBFB00DF
1400 DATA 217,FF80BFBFBFBF80FF
1410 DATA 218,00AAAA0000AAAA00
1420 DATA 227,FF5555FFFF5555FF
1430 DATA 233,FF5555FFFF5555FF
1440 DATA 252,00AAAA0000AAAA00
1450 DATA 999
1460 RESTORE 1490
1470 READ A:IF A=999 THEN RETURN
1480 READ B:VPOKE 8192+A,B:GOTO 1470
1490 DATA 5,142,12,192,13,78,14,30,15
,222,16,26,17,42,18,206,23,78,24,96,2
5,208,26,112,27,182,28,206,29,42,30,3
2,31,26,999
1500 REM TITLE
1510 SCREEN 3:COLOR 1,1,1:CLS
1520 OPEN "GRP:"AS#1
1530 FOR H=1 TO 10:J$="M.S.X":J=52:K=
24:FOR I=1 TO 2
```

FROGGER

```
1540 FOR L=1 TO LEN(J$):COLOR RND(1)*
14+2
1550 PRESET(J,K):PRINT#1,MID$(J$,L,1)
1560 J=J+32:NEXT L:J$="FROGGER"
1570 J=20:K=112:NEXT I,H
1580 GOSUB 820
1590 REM INSTRUCTIONS
1600 SCREEN 0:WIDTH 40:COLOR 14,1,1
1610 PRINTSPC(14)"INSTRUCTIONS",SPC(1
4)"~~~~~~~~~~~~":PRINT
1620 PRINT"  USING THE CURSOR KEYS,GU
IDE THE FROG":PRINT" ACROSS THE BUSY
MOTORWAY AND THE RIVER"
1630 PRINT"  IN ORDER TO REACH YOUR A
RCHWAY HOME.":PRINT:PRINT" YOU GET 10
 POINTS FOR EVERY STEP MADE"
1640 PRINT"AND 100 POINTS FOR EVERY F
ROG HOME PLUS":PRINT"A BONUS OF 1000
POINTS FOR 5 FROGS HOME":PRINT"FROM W
HERE,YOU GO ON TO THE NEXT LEVEL.":PR
INT
1650 PRINT"  EACH LEVEL GETS A LITTLE
 BIT FASTER.":PRINT:PRINT" KEEP YOUR
FROG MOVING WHEN ON THE LOGS":PRINT"
   OR MULTI-COLOURED TURTLES ETC..":
PRINT"       OR IT WILL FALL IN AND DRO
WN.":PRINT
1660 PRINT" ALSO AVOID HITTING THE FA
R RIVER BANK":PRINT " OR BEING EATEN
BY THE SLIPPERY SNAKE.":PRINT
1670 PRINT"  PRESS THE SPACE BAR TO S
TART PLAYING"
1680 IF NOT STRIG(0)THEN 1680
1690 RETURN
1700 RESTORE 1900
1710 X$="":FOR A=1 TO 32:READ B
1720 X$=X$+CHR$(B):NEXT A:A$=X$
1730 X$="":FOR A=1 TO 32:READ B
1740 X$=X$+CHR$(B):NEXT A:B$=X$
1750 X$="":FOR A=1 TO 32:READ B
1760 X$=X$+CHR$(B):NEXT A:C$=X$
1770 X$="":FOR A=1 TO 32:READ B
1780 X$=X$+CHR$(B):NEXT A:D$=X$
1790 X$="":FOR A=1 TO 32:READ B
1800 X$=X$+CHR$(B):NEXT A:E$=X$
1810 X$="":FOR A=1 TO 32:READ B
1820 X$=X$+CHR$(B):NEXT A:F$=X$
1830 X$="":FOR A=1 TO 32:READ B
1840 X$=X$+CHR$(B):NEXT A:G$=X$
1850 X$="":FOR A=1 TO 32:READ B
1860 X$=X$+CHR$(B):NEXT A:H$=X$
1870 I$="!    !    !    !    !    !    !
!"
1880 RETURN
1890 REM A$
1900 DATA 112,113,113,113,114,147,147
,147,147,147,147,104,105,105,106,147,
147,147,147,147,147,104,105,105,105,1
06,147,147,147,147,147,147
1910 REM B$
1920 DATA 147,147,147,147,147,146,40,
40,146,147,147,147,147,147,147,147,40
,120,40,146,147,147,147,147,147,147,1
47,120,40,146,40,120
1930 REM C$
1940 DATA 40,146,120,120,146,40,147,1
47,147,147,147,147,146,40,120,40,147,
147,147,147,147,120,40,146,146,40,120
,147,147,147,147,147
1950 REM D$
1960 DATA 147,147,147,147,147,104,105
,105,105,105,106,147,147,147,147,112,
113,113,113,114,147,147,147,147,112,1
13,113,113,113,113,113,114
1970 REM E$
1980 DATA 32,32,32,208,209,32,32,32,1
97,233,233,233,32,32,32,32,197,252,25
2,32,32,32,32,200,201,32,32,32,213,21
7,217,217
1990 REM F$
2000 DATA 208,209,32,32,32,32,218,218
,218,218,210,32,32,32,32,32,32,32,195
,196,32,32,32,32,184,184,184,194,32,3
2,32,32
2010 REM G$
2020 DATA 197,184,184,184,184,32,32,3
2,32,32,200,201,32,32,32,32,213,227,2
27,227,227,32,32,32,32,32,192,193,32,
32,32,32
2030 REM H$
2040 DATA 32,32,32,211,212,32,32,32,3
2,233,233,233,194,32,32,32,32,32,192,
193,32,32,32,32,32,218,218,218,218,21
0,32,32
2050 RESTORE 2100
2060 FOR A%=&HEA2F TO &HEAB8
2070 READ B$
2080 POKE A%,VAL("&H"+B$)
2090 NEXT A%:RETURN
2100 DATA 3E,05,32,50,C3,3E,04,32,51,
C3,CD,60,EA,3E,07,32,50,C3,3E,06,32,5
1,C3,CD,60,EA,3E,0F,32,50,C3,3E,0D,32
,51,C3,CD,60,EA,3E,14,32,50,C3,3E,12,
32,51,C3
2110 DATA 3A,50,C3,01,20,00,21,1F,18,
3C,3D,CA,72,EA,09,C3,6A,EA,CD,4A,00,F
5,01,1F,00,2B,CD,4A,00,23,CD,4D,00,2B
,0B,79,B0,C2,79,EA,F1,CD,4D,00
2120 DATA 3A,51,C3,01,20,00,21,00,18,
3C,3D,CA,9E,EA,09,C3,96,EA,CD,4A,00,F
5,01,1F,00,23,CD,4A,00,2B,CD,4D,00,23
,0B,79,B0,C2,A5,EA,F1,CD,4D,00,C9
2130 SCREEN 0:COLOR 15,4,4
```

INVADERS

A fairly simple game, which you'll immediately recognise from a few years ago in the amusement arcades. You control a craft at the bottom of the screen, which can only move left or right. The attackers move *en masse* from left to right and back again across the screen, all the time getting lower. You have to shoot them out of the sky before they have a chance to land.

Each time you start a new screen, the attackers start a little closer, so you have less time to destroy them.

```
1 REM *************************
2 REM **    M.S.X  INVADERS    **
3 REM **   BY  CLIFF WALTERS   **
4 REM **     MARCH  1985       **
5 REM ** FOR M.S.X COMPUTERS **
6 REM *************************
7 REM
8 REM
10 CLEAR 1000
20 ON STOP GOSUB 1140:STOP ON
30 DEFINT S
40 N=RND(-TIME):GOSUB 890
50 COLOR 15,1,1:SCREEN 1,2:WIDTH 32:K
EYOFF:GOSUB 630
60 EE=5:S=0
70 CL=8192:VPOKE CL+4,112:VPOKE CL+5,
128:VPOKE CL+12,240:VPOKE CL+13,160:V
POKE CL+14,208:VPOKE CL+15,192:VPOKE
CL+27,166
80 A=1:B=9:C=1:D=-1:E=EE:XL=INT(RND(1
)*7)+12
90 A$=STRING$(22,32)
100 B$=" "+STRING$(20,112)+" "
110 BB$=" "+STRING$(20,113)+" "
120 C$=" "+STRING$(20,104)+" "
130 CC$=" "+STRING$(20,105)+" "
140 D$=" "+STRING$(20,36)+" "
150 DD$=" "+STRING$(20,35)+" "
160 E$=" "+STRING$(20,43)+" "
170 EE$=" "+STRING$(20,42)+" "
180 CLS:LOCATE 2.0:PRINT"M.S.X INVADE
RS  SCORE:";S
190 LOCATE 0,20:PRINTSTRING$(9,120):L
OCATE 23.20:PRINTSTRING$(9,120):LOCAT
E 0,21:PRINTSTRING$(32,220)
200 PUTSPRITE 0,(XL*8-2,160),4
210 FOR X=A TO B STEP C
220 LOCATE X,E-4:PRINTA$:LOCATE X,E-3
:PRINTB$:LOCATE X,E-2:PRINTC$:LOCATE
X,E-1:PRINTD$:LOCATE X,E:PRINTE$
230 IF E>19 THEN GOSUB 490
240 ST=STICK(0):IF ST=0 THEN FOR DL=1
 TO 100:NEXT DL:GOTO 400
250 XL=XL+(ST=7 AND XL>9)-(ST=3 AND X
L<22):PUTSPRITE 0,(XL*8-2,160)
260 IF ST<>1 THEN FOR DL=1 TO 100:NEX
T DL:GOTO  400
270 SOUND 0,0:SOUND 7,198:SOUND 8,16:
SOUND 12,2:SOUND 13,3
280 FOR M=19 TO E STEP-3:LOCATE XL,M:
PRINT"<":LOCATE XL.M:PRINT" ":NEXT M
290 F=0:Q$=E$:QQ$=EE$:R=0:GOSUB 420:E
$=Q$:EE$=QQ$
300 IF F=1 THEN 390
310 LOCATE XL,E-1:PRINT"<":LOCATE XL,
E-1:PRINT" "
320 Q$=D$:QQ$=DD$:R=1:GOSUB 420:D$=Q$
:DD$=QQ$
330 IF F=1 THEN 390
340 LOCATE XL,E-2:PRINT"<":LOCATE XL,
E-2:PRINT" "
350 Q$=C$:QQ$=CC$:R=2:GOSUB 420:C$=Q$
:CC$=QQ$
360 IF F=1 THEN 390
370 LOCATE XL.E-3:PRINT"<":LOCATE XL.
E-3:PRINT" "
380 Q$=B$:QQ$=BB$:R=3:GOSUB 420:B$=Q$
:BB$=QQ$
390 IF B$="" AND C$="" AND D$="" AND
E$="" THEN 550
400 SWAP B$,BB$:SWAP C$,CC$:SWAP D$,D
D$:SWAP E$,EE$
410 NEXT X:E=E+1:SWAP A.B:SWAP C.D:GO
TO 210
420 IF Q$="" OR MID$(Q$.XL-X+1.1)=" "
 THEN RETURN
430 LOCATE XL,E-R:PRINT"`"
440 MID$(Q$,XL-X+1)=" ":MID$(QQ$.XL-X
+1)=" ":F=1:S=S+25-E
450 LOCATE XL.E-R:PRINT"a":BEEP:LOCAT
E 24.0:PRINT S
460 LOCATE XL,E-R:PRINT" "
470 IF Q$=A$ THEN Q$="":QQ$=""
480 RETURN
490 IF E>19 AND E$<>"" THEN 540
500 IF E>20 AND D$<>"" THEN 540
510 IF E>21 AND C$<>"" THEN 540
520 IF E>22 THEN 540
530 RETURN
540 FOR DL=1 TO 500:NEXT DL:PUTSPRITE
0,(-32,0):CLS:LOCATE 3,5:PRINT"THE AL
IENS HAVE TAKEN OVER":GOTO 610
550 COLOR 15,15,15:PUTSPRITE0,(0,209)
:FOR DL=1 TO 25:NEXT DL:COLOR 15,1,1:
GOSUB 960
560 CLS:LOCATE 0,5:PRINT" YOU HAVE DE
FEATED THE ALIENS!!"
570 LOCATE 0,7:PRINT" AND SCARED OFF
THE MOTHER SHIP"
580 LOCATE 6,11:PRINT"YOUR SCORE IS:"
;S
590 LOCATE 0,18:PRINT"BUT ANOTHER WAV
E IS APPROACHING."
600 EE=EE+.5:FOR DL=1 TO 1500:NEXT DL
:GOTO 70
610 LOCATE 6,10:PRINT"YOUR SCORE WAS:
";S:LOCATE 2.20:PRINT"PPESS SPACE-BAR
 TO PLAY AGAIN"
620 IF NOT STRIG(0)THEN 620 ELSE 60
630 PRINTTAB(10)"INSTRUCTIONS":PRINTT
AB(10);"~~~~~~~~~~~~":PRINT:PRINT
640 PRINT" USE THE LEFT AND RIGHT CUR
SOR":PRINT:PRINT"  KEYS TO MOVE YOUR
LASER BASE":PRINT:PRINT" AND THE CURS
OR UP KEY TO FIRE":PRINT
650 PRINT"QUICK SHOOTING EARNS MORE P
OINTS":PRINT"AS DOES HITTING THE MOTH
ER SHIP":PRINT:PRINT"  AND A NEW WAVE
 ARRIVES AFTER":PRINT:PRINT"   EACH W
AVE IS DESTROYED AND"
660 PRINT:PRINT" THE MOTHER SHIP IS B
EATEN OFF":LOCATE 8,22:PRINT"ONE MOME
NT PLEASE"
670 RESTORE 840
680 SP$="":FOR J=0 TO 7:READ K
690 SP$=SP$+CHR$(K):NEXT J
700 SPRITE$(0)=SP$
710 SP$="":FOR I=0 TO 7
```

INVADERS

```
720 SP$=SP$+CHR$(VPEEK(1504+I))
730 NEXT I:SPRITE$(1)=SP$
740 FOR H=2 TO 3:SP$(H)="":FOR I=0 TO
 31:READ SP
750 SP$(H)=SP$(H)+CHR$(SP):NEXT I
760 SPRITE$(H)=SP$(H):NEXT H
770 RESTORE 870
780 READ CH:IF CH=999 THEN 820
790 FOR J=0 TO 7:READ K
800 VPOKE CH*8+J,K:NEXT J
810 GOTO 780
820 LOCATE 4,22:PRINT"PRESS SPACE-BAR
 TO PLAY"
830 IF NOT STRIG(0)THEN 830 ELSE RETU
RN
840 DATA 12,12,12,30,30,63,63,63
850 DATA 0,0,0,0,7,31,63,237,237,63,3
1,7,0,0,0,0,0,0,0,0,224,248,252,191,1
91,252,248,224,0,0,0,0
860 DATA 0,0,0,0,7,31,63,251,251,63,3
1,7,0,0,0,0,0,0,0,0,224,248,252,111,1
11,252,248,224,0,0,0,0
870 DATA 35,130,68,124,84,124,68,130,
0,36,68,40,124,84,124,40,68,0,42,124,
214,254,108,254,146,40,108,43,124,214
,254,108,254,40,40,198,96,17,186,124,
62,255,126,92,138,97,161,82,42,28,63,
200,166,36
880 DATA 104,28,62,42,127,20,34,65,0,
105,28,62,42,127,20,34,34,34,112,56,1
24,130,214,124,40,40,40,113,56,124,13
0,214,124,40,68,130,120,255,171,213,1
71,213,171,213,255,999
890 COLOR 1,1,1:SCREEN 3
900 OPEN "GRP:"AS#1
910 FOR I=1 TO 10:M$="M.S.X":Y=24:X=4
8
920 FOR K=1 TO 2:FOR J=1 TO LEN(M$):C
OLOR RND(1)*14+2
930 PRESET(X,Y):PRINT#1,MID$(M$,J,1)
940 X=X+32:NEXT J
950 M$="INVADERS":Y=120:X=4:NEXT K,I:
RETURN
960 Y=1:XR=15:Z=0
970 CL=8192:VPOKE CL+4,112:VPOKE CL+5
,128:VPOKE CL+12,240:VPOKE CL+13,160:
VPOKE CL+14,208:VPOKE CL+15,192:VPOKE
 CL+27,166
980 CLS:LOCATE 2,0:PRINT"M.S.X INVADE
RS  SCORE:";S
990 LOCATE 0,20:PRINTSTRING$(9,120):L
OCATE 23,20:PRINTSTRING$(9,120):LOCAT
E 0,21:PRINTSTRING$(32,220)
1000 PUTSPRITE 0,(XR*8-2,160),4
1010 FOR DL=1 TO 250:NEXT DL
1020 ON INTERVAL=3 GOSUB 1130:ON SPRI
TE GOSUB 1120
1030 INTERVAL ON:SPRITE ON
1040 ST=STICK(0):IF ST=0 THEN FOR DL=
1 TO 10:NEXT DL:GOTO 1100
1050 XR=XR+(ST=7 AND XR>9)-(ST=3 AND
XR<22)
1060 PUTSPRITE 0,(XR*8-2,160)
1070 IF ST<>1 THEN FOR DL=1 TO 10:NEX
T DL:GOTO 1100
1080 SOUND 0,0:SOUND 7,198:SOUND 8,16
:SOUND 12,2:SOUND 13,3
1090 FOR M=148 TO 24 STEP-3:PUTSPRITE
 1,(XR*8,M),15:NEXT M:PUTSPRITE 1,(-3
2,0)
1100 IF Z<0 OR Z>240 THEN 1110 ELSE 1
040
1110 INTERVAL OFF:SPRITE OFF:FOR I=0
TO 3:PUTSPRITE I,(-32,0):NEXT I:RETUR
N
1120 INTERVAL OFF:SPRITE OFF:PUTSPRIT
E 1,(-32,0):BEEP:FOR DL=1 TO 25:NEXT
DL:Y=1.2*-Y:S=S+RND(1)*50+25:LOCATE 2
4,0:PRINT S:RETURN 1030
1130 Z=Z+Y:PUTSPRITE 2,(Z,24),10,2:PU
TSPRITE2,,,3:RETURN
1140 INTERVAL OFF:SPRITE OFF:SCREEN 1
:COLOR 15,4,4
```

SNAKEY

Here's a good implementation of the well-known game where you guide a snake around the screen, eating food and avoiding walls and monsters—and the snake's ever-growing tail.
Lots of skill is required. If you manage to clear a screen of all the food, you move onto another level. There are 10 skill levels in all.

```
5 REM ******* SNAKEY *******
6 REM *     M.S.X VERSION    *
7 REM *  BY CLIFF WALTERS    *
8 REM *    MAY/JUNE  1985    *
9 REM ********************
10 CLEAR 500
20 ON STOP GOSUB 1220:STOP ON
30 SCREEN 1:WIDTH 32:KEY OFF
40 DIM B(100),S(100)
50 DEF USR0=&H156
60 COLOR 15,1,1:GOSUB 1070:GOSUB 940:
GOSUB 760
70 FD=5:N=RND(-TIME)
80 SC=0:HI=0:XX=1
90 CLS:LOCATE 1,0:PRINT"SCORE:";SC:LO
CATE 17,0:PRINT"HI-SCORE:";HI
100 FOR A=6176 TO 6207:VPOKE A,113:VP
OKE A+704,113:NEXT
110 FOR A=6208 TO 6880 STEP 32:VPOKE
A,113:VPOKE A+10,113:VPOKE A+21,113:V
POKE A+31,113:NEXT
120 REM SPACES
130 FOR A=1 TO 4
140 X=6186+32*INT(RND(1)*20+1):IF VPE
EK(X)=32 THEN 140
150 VPOKE X,32
160 X=6197+32*INT(RND(1)*20+1):IF VPE
EK(X)=32 THEN 160
170 VPOKE X,32:NEXT A
180 REM MONSTERS
190 FOR A=1 TO XX
200 C=6209+INT(RND(1)*670):IF VPEEK(C
)<>32 OR C=6275 THEN 200
210 B(A)=C:VPOKE C,128:NEXT A
220 REM FOOD
```

SNAKEY

```
230 FOR A=1 TO FD
240 E=6209+INT(RND(1)*670):IF VPEEK(E)<>32 OR E=6275 THEN 240
250 VPOKE E,120:NEXT A
260 P=0:R=1:S=1:S(0)=6275:H=106:VPOKE S(0),H
270 PLAY"T255L64O3C64O4C64O5C64O6C64"
280 FOR DL=1 TO 250:NEXT DL
290 FOR DL=1 TO SK:NEXT DL
300 T=STICK(0)+STICK(1):IF T=0 THEN 350
310 IF T=1 THEN R=-32:H=107:GOTO 350
320 IF T=5 THEN R=32:H=105:GOTO 350
330 IF T=3 THEN R=1:H=106:GOTO 350
340 IF T=7 THEN R=-1:H=104
350 IF S<5 THEN S=S+1:GOTO 370
360 VPOKE S(S),32
370 FOR A=S TO 1 STEP-1:S(A)=S(A-1):NEXT A:S(0)=S(0)+R
380 Z=VPEEK(S(0)):IF Z=113 OR Z=128 THEN 630
390 VPOKE S(0),H:VPOKE S(1),97
400 IF Z=97 THEN 630
410 IF Z=120 THEN GOSUB 600
420 Y=INT(RND(1)*XX)+1
430 V=INT(RND(1)*4)+1
440 W=32*(V=1)-32*(V=2)-(V=3)+(V=4)
450 IF VPEEK(B(Y)+W)=32 THEN M=W:GOTO 470
460 GOTO 290
470 IF VPEEK(B(Y)+M)<>32 THEN 630
480 VPOKE B(Y),32:B(Y)=B(Y)+M:VPOKE B(Y),128
490 GOTO 290
500 FOR D=1 TO 500:NEXT D
510 GOSUB 750:CLS
520 LOCATE 3,5:PRINT"WELL DONE! YOU'VE FINISHED":LOCATE 12,9:PRINT "SCREEN";FD/5
530 BN=90-SK+FD
540 LOCATE 7,13:PRINT BN:"BONUS POINTS!":LOCATE 2,21:PRINT "PRESS SPACE BAR FOR SCREEN"FD/5+1
550 IF NOT STRIG(0) THEN 550
560 SC=SC+BN:FD=FD+5:XX=XX+1
570 GOSUB 1100
580 IF FL=1 THEN GOSUB 860
590 FL=0:GOTO 90
600 BEEP:SC=SC+1:P=P+1:S=S+1
610 LOCATE 7,0:PRINTSC
620 IF P=FD THEN 500 ELSE RETURN
630 PLAY "T255L64O6C64O5C64O4C64O3C64"
640 FOR J=1 TO 10:VPOKE 8205,INT(RND(1)*16)*16
650 FOR DL=1 TO 50:NEXT DL,J
660 CLS:LOCATE 11,5:PRINT "GAME OVER"
670 LOCATE 6,8:PRINT "YOU SCORED":SC:"POINT";:IF SC<>1 THEN PRINT"S"
680 IF SC>HI THEN GOSUB 740:GOTO 700
690 LOCATE 3,12:PRINT "THE HI-SCORE IS":HI:"POINT";:IF HI<>1 THEN PRINT"S"
700 GOSUB 750
710 LOCATE 1,21:PRINT "PRESS SPACE BAR TO PLAY AGAIN."
720 IF NOT STRIG(0)THEN 720
730 SC=0:XX=1:FD=5:FL=1:GOTO 570
740 LOCATE 3,10:PRINT "YOU HAVE THE NEW HI-SCORE":HI=SC:RETURN
750 FOR J=0 TO S+1:B(J)=0:S(J)=0:NEXT J:RETURN
760 U=USR0(0):CLS:LOCATE 0,21:PRINT"DO YOU WANT INSTRUCTIONS Y/N ?"
770 LOCATE 31,21:Q$=INPUT$(1)
780 IF Q$="N" OR Q$="n" THEN 860
790 IF Q$<>"Y" AND Q$<>"y" THEN BEEP:GOTO 770
800 CLS:PRINTSPC(11)"qqqqqqqqqq":PRINT SPC(11)"q SNAKEY q",SPC(11)"qqqqqqqqqq":PRINT:PRINT
810 PRINT "USING THE CURSOR KEYS,GUIDE THE":PRINT:PRINT" SNAKE AROUND THE SCREEN TO EAT":PRINT
820 PRINT " THE YELLOW FOOD,WHILE AVOIDING":PRINT:PRINT"  THE WALLS AND THE MONSTERS."
830 PRINT:PRINT:PRINT" MAKE SURE THAT THE SNAKE DOES":PRINT:PRINT" NOT TRY TO BITE IT'S OWN BODY."
840 PRINT:PRINT:PRINT"  JOYSTICK 1 CAN ALSO BE USED":LOCATE 4,22:PRINT"PRESS SPACE BAR TO PLAY"
850 IF NOT STRIG(0)THEN 850
860 CLS:LOCATE 0,18:PRINT"ENTER SKILL LEVEL 0 TO 9"
870 LOCATE 0,20:PRINT"0=FAST    9=SLOW ?"
880 U=USR0(0):LOCATE 18,20:SK$=INPUT$(1)
890 IF ASC(SK$)<48 OR ASC(SK$)>57 THEN BEEP:GOTO 880
900 SK=VAL(SK$)
910 LOCATE 17,20:PRINTSK
920 FOR DL=1 TO 250:NEXT DL
930 SK=SK*10:RETURN
940 B$=STRING$(32,32)+"h"+STRING$(20,97)+CHR$(95)
950 A$(1)=B$+STRING$(10,112)+CHR$(32):A(1)=5
960 A$(2)=B$+"x SNAKEY x "+C$:A(2)=6
970 A$(3)=B$+STRING$(10,112)+CHR$(32):A(3)=7
980 FOR I=1 TO 3:FOR A=1 TO 44
990 LOCATE 0,A(I):PRINT MID$(A$(I),A,32):GOSUB 1050:NEXT A
1000 FOR A=10 TO 0 STEP-1:LOCATE A,A(I):PRINT CHR$(32):GOSUB 1050:NEXT A,I
1010 FOR I=8 TO 0 STEP-1:SOUND8,I:FOR D=1 TO 50:NEXTD,I
1020 LOCATE 0,20:PRINT"PRESS SPACE BAR TO START PLAYING"
1030 IF NOT STRIG(0)THEN 1030
1040 CLS:SOUND7,248:SOUND8,0:RETURN
1050 Q=RND(1)*255:SOUND0,Q:SOUND 1,0:SOUND6,5:SOUND7,246:SOUND8,8
1060 FOR D=1 TO 20:NEXT:RETURN
1070 READ A:IF A=999 THEN 1100
1080 FOR B=0 TO 7:READ C
1090 VPOKE A*8+B,C:NEXT B:GOTO 1070
1100 L=8192:VPOKE L+12,&H40:VPOKE L+13,&HC0:VPOKE L+14,&H6B:VPOKE L+15,&HB0:VPOKE L+16,&H70
1110 RETURN
1120 DATA 97,126,255,255,255,255,255,255,126
1130 DATA 104,30,63,79,255,255,79,63,30
1140 DATA 105,126,255,255,255,219,90,
```

SNAKEY

```
60,24
1150 DATA 106,120,252,242,255,255,242
,252,120
1160 DATA 107,24,60,90,219,255,255,25
5,126
1170 DATA 112,255,129,169,149,169,149
,129,255
1180 DATA 113,223,223,0,251,251,251,0
,223
1190 DATA 120,0,60,126,114,78,126,60,
0
1200 DATA 128,28,62,107,62,73,34,73,3
4
1210 DATA 999
1220 SOUND8,0:SCREEN 1:COLOR 15,4,4
```

HI-LOW

Fans of Bruce Forsythe's TV Show *Play your cards right* will immediately recognise this game. Five cards (face down) appear with the first turned up. You have to guess whether the next card is of a higher or lower value.

If you're right, you go onto the next card, if not you lose some of your £100 stake and are invited to deal again. The card graphics are very realistic, and strings with control characters have been used to produce cards and pictures much faster than printing one character at a time.

```
5 REM *****   HI-LOW   *****
6 REM * BY CLIFF WALTERS. *
7 REM * FOR MSX COMPUTERS *
8 REM ***** JUNE 1985 *****
9 REM
10 CLEAR 500
20 ON STOP GOSUB 1520:STOP ON
30 SCREEN 1:WIDTH 32:KEYOFF
40 DEFINT A-Z
50 LOCATE 13,3:PRINT"HI-LOW",TAB(13)"
******"
60 LOCATE 8,20:PRINT"ONE MOMENT PLEAS
E"
70 N=RND(-TIME)
80 DIM C$(13,4)
90 DEF USR=&H156
100 REM CHAR DEF
110 FOR B=1 TO 8:FOR A=0 TO 7
120 VPOKE(128+B)*8+A,VPEEK((49+B)*8+A
)/2
130 VPOKE(146+B)*8+A,VPEEK((49+B)*8+A
)/2
140 NEXT A,B
150 FOR A=0 TO 7
160 VPOKE 280+A,VPEEK(1248+A)
170 VPOKE 1024+A,VPEEK(520+A)/2
180 VPOKE 1168+A,VPEEK(520+A)/2
190 VPOKE 1136+A,VPEEK(40+A)
200 VPOKE 1144+A,VPEEK(48+A)
210 VPOKE 1152+A,VPEEK(32+A)
220 VPOKE 1160+A,VPEEK(24+A)
230 VPOKE 1104+A,VPEEK(592+A)/2
240 VPOKE 1248+A,VPEEK(592+A)/2
250 VPOKE 1112+A,VPEEK(648+A)/2
260 VPOKE 1256+A,VPEEK(648+A)/2
270 VPOKE 1120+A,VPEEK(600+A)/2
280 VPOKE 1264+A,VPEEK(600+A)/2
290 NEXT A
300 RESTORE 350
310 C=0:READ A:IF A=999 THEN 600
320 A$="":READ A$:FOR J=1 TO LEN(A$)S
TEP 2
330 VPOKE A*8+C,VAL("&H"+MID$(A$,J,2)
)
340 C=C+1:NEXT J:GOTO 310
350 DATA 96,00706142050A1429
360 DATA 97,7E99245AC324A5A5
370 DATA 98,000E8642A0502894
380 DATA 99,52E44241201C0201
390 DATA 100,A5A5A524A57E1800
400 DATA 101,4A27428204384080
410 DATA 102,000000081C1C2A7F
420 DATA 103,8142242424242424
430 DATA 104,000000367F7F7F3E
440 DATA 105,7F2A010E0E010008
450 DATA 106,1800E71818E71818
460 DATA 107,1C08807070800008
470 DATA 108,1C3E7F7F3E08030E
480 DATA 109,181818181818E78118
490 DATA 110,1C3E7F3E1C08C070
500 DATA 111,3841475C70000070
510 DATA 112,7EC35ABD5A183C42
520 DATA 113,1C86E23A0E00000E
530 DATA 114,88A9AAB4A8906000
540 DATA 115,C35A5A4224181800
550 DATA 116,1195552D15090600
560 DATA 137,0026692929297600
570 DATA 155,0026692929297600
580 DATA 160,FFC3BDA5A5BDC3FF
590 DATA 999
600 D$=STRING$(5,8)+CHR$(10):E$=STRIN
G$(5,120):F$=""
610 FOR I=1 TO 9:F$=F$+E$+D$:NEXT I:R
EM CARD BLANK
620 L$=STRING$(3,8)+CHR$(10):M$=STRIN
G$(3,160):N$=""
630 FOR I=1 TO 7:N$=N$+M$+L$:NEXT I:R
EM CARD BACK
640 Q$="`ab"+L$+"cde"+L$+"fgh"+L$+"ij
k"+L$+"lmn"+L$+"opq"+L$+"rst":REM J,Q
,K PICTURE
650 COLOR 1,3,3:CL=8192
660 VPOKE CL+12,177:VPOKE CL+13,177:V
POKE CL+14,177:VPOKE CL+15,255:VPOKE
CL+16,31
670 VPOKE CL+17,31:VPOKE CL+18,143:VP
OKE CL+19,143:VPOKE CL+20,95:VPOKE CL
+31,0
680 REM DEAL
690 X(1)=1:X(2)=7:X(3)=13:X(4)=19:X(5
)=25
700 CLS:GOSUB 1450
710 M=100:GOSUB 1390
720 FOR T=1 TO 5
730 U=USR(0)
740 CARD(T)=INT(RND(1)*13)+1
750 SUIT(T)=INT(RND(1)*4)+1
```

HI-LOW

```
760 IF C$(CARD(T),SUIT(T))="X"THEN 74
0
770 C$(CARD(T),SUIT(T))="X"
780 IF T>1 THEN 810
790 LOCATE 8,22:PRINT"PRESS D TO DEAL
"
800 GOTO 820
810 LOCATE 4,22:PRINT"HIGHER OR LOWER
 H OR L ?"
820 LOCATE 28,22:K$=INPUT$(1)
830 K=ASC(K$):IF T<>1 THEN 850
840 IF K<>68 THEN 820 ELSE CLS:GOTO 8
90
850 IF K=72 THEN LOCATE(T-1)*6+1,3:PR
INT"HIGH"
860 IF K=76 THEN LOCATE(T-1)*6+2,3:PR
INT"LOW"
870 IF K=72 OR K=76 THEN 880 ELSE 820
880 LOCATE 0,22:PRINTSTRING$(30,32)
890 GOSUB 990
900 IF T=1 THEN LOCATE 1,3:PRINT"DEAL
T"
910 IF T=1 OR CARD(T)=1 OR CARD(T-1)=
1 THEN 960
920 IF K=72 AND CARD(T)>CARD(T-1)THEN
 970
930 IF K=72 AND CARD(T)<CARD(T-1)THEN
 1380
940 IF K=76 AND CARD(T)>CARD(T-1)THEN
 1380
950 IF K=76 AND CARD(T)<CARD(T-1)THEN
 970
960 IF CARD(T)=CARD(T-1)THEN 1380
970 NEXT T
980 GOTO 1440
990 PLAY "T255L64V602B6403B6404B6405B
64"
1000 REM MAIN GRAPHIC SUBROUTINE
1010 G=SUIT(T)+141
1020 IF SUIT(T)<3 THEN 1050
1030 N=CARD(T)+145
1040 GOTO 1060
1050 N=CARD(T)+127
1060 LOCATE X(T),6:PRINTF$
1070 LOCATE X(T),6:PRINTCHR$(N)
1080 LOCATE X(T)+4,14:PRINTCHR$(N)
1090 LOCATE X(T),7:PRINTCHR$(G)
1100 LOCATE X(T)+4,13:PRINTCHR$(G)
1110 ON CARD(T) GOSUB 1190,1200,1220,
1230,1260,1270,1300,1320,1350,1360,13
70,1370,1370
1120 IF T>1 THEN RETURN
1130 XX=X(T)+6
1140 FOR I=1 TO 4
1150 FOR DL=1 TO 250:NEXT DL
1160 LOCATE XX,6:PRINT F$
1170 LOCATE XX+1,7:PRINT N$
1180 XX=XX+6:NEXT I:RETURN
1190 LOCATE X(T)+2,10:PRINTCHR$(G):RE
TURN:REM ACE
1200 LOCATE X(T)+2,8:PRINTCHR$(G)
1210 LOCATE X(T)+2,12:PRINTCHR$(G):RE
TURN:REM 2
1220 GOSUB 1200:GOSUB 1190:RETURN:REM
 3
1230 FOR P=1 TO 2
1240 LOCATE X(T)+2*P-1,8:PRINTCHR$(G)
1250 LOCATE X(T)+2*P-1,12:PRINTCHR$(G
):NEXT P:RETURN:REM 4
1260 GOSUB 1190:GOSUB 1230:RETURN:REM
 5
1270 GOSUB 1230
1280 LOCATE X(T)+1,10:PRINTCHR$(G)
1290 LOCATE X(T)+3,10:PRINTCHR$(G):RE
TURN:REM 6
1300 GOSUB 1270
1310 LOCATE X(T)+2,9:PRINTCHR$(G):RET
URN:REM 7
1320 FOR P=1 TO 4
1330 LOCATE X(T)+1,5+2*P:PRINTCHR$(G)
1340 LOCATE X(T)+3,5+2*P:PRINTCHR$(G)
:NEXT P:RETURN:REM 8
1350 GOSUB 1320:GOSUB 1190:RETURN:REM
 9
1360 GOSUB 1320:GOSUB 1200:RETURN:REM
 10
1370 LOCATE X(T)+1,7:PRINT Q$:RETURN:
REM PIC
1380 LOCATE 12,20:PRINT"YOU LOSE":M=M
-5*T
1390 LOCATE 9,22:PRINT"YOU HAVE #";M
1400 FOR DL=1 TO 750:NEXT DL
1410 FOR F=1 TO 13:FOR G=1 TO 4
1420 C$(F,G)="":NEXT G,F
1430 GOTO 720
1440 LOCATE 12,20:PRINT"YOU WIN":M=M+
50:GOTO 1390
1450 PRINTSPC(10)"INSTRUCTIONS",SPC(1
0)"************":PRINT:PRINT
1460 PRINT"     YOU HAVE TO GUESS IF T
HE":PRINT:PRINT"  NEXT CARD IS HIGHER
 OR LOWER":PRINT:PRINT"      THAN THE
PREVIOUS ONE.":PRINT:PRINT
1470 PRINT"       ACE IS HIGH OR LOW."
:PRINT:PRINT:PRINT"   YOU GET NOTHING
 FOR A PAIR":PRINT
1480 PRINT"  AND YOU START OFF WITH #
100.":PRINT:PRINT:PRINT" MAKE SURE TH
E CAPS LOCK IS ON."
1490 LOCATE 5,22:PRINT"PRESS SPACE BA
R TO PLAY"
1500 IF NOT STRIG(0)THEN 1500
1510 CLS:RETURN
1520 SCREEN 1:COLOR 15,4,4
```

PACMAN

Surely everyone has played this all-time classic at some time or other. It's a pretty straightforward version, but with one snag. You have to clear each screen within the time limit — and it's really tight!

In all, a difficult task, but challenging — especially with the two ghosts chasing you around the maze.

```
10 REM ************************
20 REM *     M.S.X PACMAN      **
30 REM *    BY C.R.WALTERS     **
40 REM * SPECTRAVIDEO SVI 728 *
50 REM ************************
60 CLEAR 500
70 ON STOP GOSUB 730:STOP ON
80 DEFINT A-Z
90 DEFUSR0=&H41:DEFUSR1=&H44
```

PACMAN

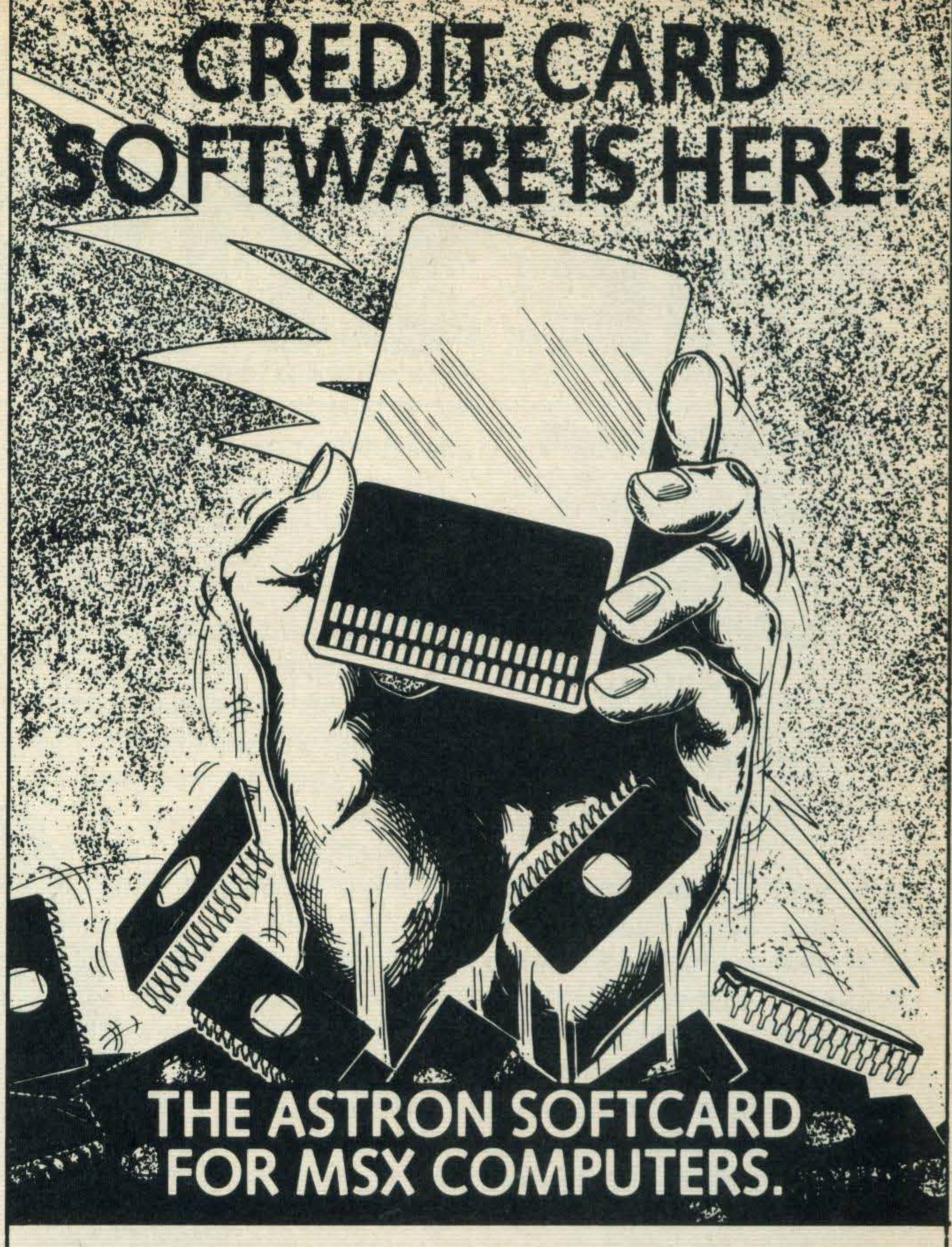
```
100 N=RND(-TIME):CL=8192:GOSUB 670
110 SCREEN 1,0:WIDTH 32:KEY OFF
120 GOSUB 610:GOSUB 400
130 CLS:LI=3:GOSUB 460
140 U=USR1(0):SC=0:TI=800:LOCATE1,22:
PRINT"LIVES";LI;SPC(2)"SCORE";SC:LOCA
TE21,22:PRINT"TIME";TI
150 Z=6799:VPOKE Z,96
160 R(0)=INT(RND(1)*19)+1:C(0)=INT(RN
D(1)*13)+2:IF VPEEK(32*R(0)+C(0)+6144
)<>46 THEN 160
170 R(1)=INT(RND(1)*19)+1:C(1)=INT(RN
D(1)*13)+16:IF VPEEK(32*R(1)+C(1)+614
4)<>46 THEN 170
180 E(0)=8:E(1)=13:FOR B=0 TO 1:PUTSP
RITE B,(C(B)*8,R(B)*8-1),E(B),0:PUTSP
RITE 2,(C(B)*8,R(B)*8-1),7,1:NEXT B
190 S=STICK(0):IF S=0 THEN 240
200 X=32*(S=1)-(S=3)-32*(S=5)+(S=7)
210 W=VPEEK(Z+X):IF W=120 THEN 240
220 IF W=46 THEN SC=SC+1:LOCATE 16,22
:PRINTSC:IF SC=265 THEN 590
230 VPOKE Z,32:Z=Z+X:VPOKE Z,96
240 FOR D=0 TO 1
250 IF VPEEK(32*R(D)+C(D)+6144)=96 TH
EN Y1=0:X1=0:GOTO 350
260 TI=TI-1:LOCATE 25,22:PRINTTI:IF T
I=0 THEN 360
270 A=INT(RND(1)*4)+1:ON A GOTO 280,2
90,300,310
280 X1=1:Y1=0:GOTO 320
290 Y1=-1:X1=0:GOTO 320
300 X1=-1:Y1=0:GOTO 320
310 Y1=1:X1=0
320 P=VPEEK(32*(R(D)+Y1)+C(D)+X1+6144
):IF P=96 THEN 350 ELSE IF P=120 THEN
 340
330 R(D)=R(D)+Y1:C(D)=C(D)+X1:PUTSPRI
TE D,(C(D)*8,R(D)*8-1):PUTSPRITE 2,(C
(D)*8,R(D)*8-1)
340 NEXT D:GOTO 190
350 R(D)=R(D)+Y1:C(D)=C(D)+X1:PUTSPRI
TE D,(C(D)*8,R(D)*8-1):PUTSPRITE 2,(-
24,0)
360 GOSUB 660:FOR J=1 TO 8:VPOKE CL+1
2,160:FOR DL=1 TO 30:NEXT DL:VPOKE CL
+12,96:FOR DL=1 TO 30:NEXT DL:VPOKE C
L+12,64:FOR DL=1 TO 30:NEXT DL,J
370 VPOKE Z,32:LI=LI-1:FOR DL=1 TO 25
0:NEXT DL:LOCATE 6,22:PRINTLI
380 FOR DL=1 TO 500:NEXT DL:FOR Q=0 T
O 2:PUTSPRITE Q,(-24,0):NEXT Q:IF LI=
0 THEN 560
390 CLS:GOSUB 460:GOTO 140
400 FOR I=1 TO 3:M$="":C=0:READ M,M$
410 FOR J=1 TO LEN(M$)STEP 2
420 VPOKE M*8+C,VAL("&H"+MID$(M$,J,2)
):C=C+1:NEXT J,I
430 DATA 46,0000001818000000.96,183C1
83C5A182466,120,DFDF00FBFBFB00DF
440 M$(0)="66247EDBDBFFFF99":M$(1)="0
000002424000000"
450 FOR I=0 TO 1:S$="":FOR J=1 TO LEN
(M$(I))STEP 2:S$=S$+CHR$(VAL("&H"+MID
$(M$(I),J,2))):NEXT J:SPRITE$(I)=S$:N
EXT I:RETURN
460 U=USR0(0):COLOR 1,15,15:VPOKE CL+
11,96:VPOKE CL+12,64:VPOKE CL+15,&HCA
470 PRINT" xxxxxxxxxxxxxxxxxxxxxxxxxx
xxx    x........................x
 x.x.xxxxxxxxxxx.xxxxxxxxxxx.x.x"
480 PRINT" x.x.......................
x.x    x.xxxxxxxxxxxxx.xxxxxxxxxxxxx.x
 x..........x.x...........x"
490 PRINT" x.xxxxxxxxxx.x.x.xxxxxxxxx
x.x    x.xxxxxxxxxx.x.x.xxxxxxxxxx.x"
500 PRINT" x.xxxxxxxxxx.x.x.xxxxxxxxx
x.x    x..........x.x............x
 x.xx...xxxx.x.x.xxxx...xx.x"
510 PRINT" x......xxxx.x.x.xxxx.....
..x    x.x.xxx.xxxx.x.x.xxxx.xxx.x.x
 x.x.xxx.xxxx.x.x.xxxx.xxx.x.x"
520 PRINT" x.x.xxx.....x.x.....xxx.
x.x    x.x.xxxxxxxx.x.x.xxxxxxxx.x.x
 x.x.xxxxxxxx.x.x.xxxxxxxx.x.x"
530 PRINT" x.x.xxxxxxxx.x.x.xxxxxxxx.
x.x    x.x....................x.x
 x.xxxxxxxxxxxx.xxxxxxxxxxxx.x"
540 PRINT" x.........................
..x    xxxxxxxxxxxxxxxxxxxxxxxxxxxx"
550 RETURN
560 COLOR 1,11,11:CLS:LOCATE 9,5:PRIN
T"ALL LIVES LOST"
570 LOCATE 2,18:PRINT"PRESS SPACE-BAR
 TO PLAY AGAIN"
580 IF NOT STRIG(0) THEN 580 ELSE 130
590 FOR L=0 TO 2:PUTSPRITE L,(-24,0):
NEXT L:COLOR 4,14,6:CLS
600 LOCATE 1,5:PRINT"WELL DONE,YOU CL
EARED THE MAZE":GOTO 570
610 CLS:COLOR 1,11,11
620 PRINT SPC(9);"INSTRUCTIONS",SPC(9
);"************":PRINT:PRINT:PRINT:PR
INTSPC(6)"USING THE CURSOR KEYS":PRIN
T
630 PRINT" GUIDE YOUR MAN AROUND THE
MAZE",,,"TO EAT THE DOTS AND GAIN POI
NTS.",,,,"YOU HAVE LIMITED TIME TO DO
 THIS":PRINT
640 PRINT"AND GHOSTS WILL TRY TO STOP
 YOU.":PRINT:PRINT:PRINT"     PRESS SP
ACE-BAR TO PLAY"
650 IF NOT STRIG(0) THEN 650 ELSE COL
OR 14,14,14:RETURN
660 PLAY"T64L64O6CEGO5CEGO4CEGO3CEG":
RETURN
670 COLOR 15,15,15:SCREEN 3
680 OPEN"GRP:"AS#1
690 FOR L=1 TO 10:T$(0)="M.S.X":A(0)=
54:B(0)=24
700 T$(1)="PAC-MAN":A(1)=20:B(1)=120
710 FOR V=0 TO 1:FOR T=1 TO LEN(T$(V)
):COLOR RND(1)*12+2:PRESET(A(V),B(V))
:PRINT#1,MID$(T$(V),T,1):A(V)=A(V)+32
:NEXT T,V,L
720 RETURN
730 SCREEN 1:COLOR 15.4,4
```

FAIRGROUND DUCKSHOOT

How's your aim? In this game you're trying to shoot the ducks to gain points. Lots of balloons are floating by between you and the ducks, so you have to avoid them if possible. Shooting them does gain you an extra few points, though.

You have a limited supply of ammunition, but if you still manage to shoot down six ducks, you move onto the next screen. It's pretty tricky, but it can be done.

```
4 REM ************************
5 REM * FAIRGROUND DUCKSHOOT *
6 REM *   BY CLIFF WALTERS   *
7 REM *     FEBRUARY  1985   *
8 REM * FOR M.S.X. COMPUTERS *
9 REM ************************
10 COLOR 14,1,1:SCREEN 1:WIDTH 32:KEY
 OFF:CLEAR 500
20 ON STOP GOSUB 560:STOP ON
30 LOCATE 10,5:PRINT"DUCK SHOOT",TAB(
10);"=========="
40 GOSUB 400:GOSUB 490
50 COLOR 15,3,1:CLS:RESTORE 60:CL=819
2:FOR I=1 TO 7:READ A,B:VPOKE CL+A,B:
NEXT I
60 DATA 4,160,5,64,12,96,13,192,14,20
8,15,240,16,168
70 S=0:N=RND(-TIME)
80 Z$=STRING$(42,32):A$="`h       `h
  `h      `h      `h      `h     "
90 B$="i     a     q     (     i    a "
100 C$=" q     i     (     a     i     ( "
110 D$=" (     q     i     a     q     i "
120 A=INT(RND(1)*18)+5:SH=40
130 LOCATE 2,0:PRINT"////ggggnnnnvvvv
nnnngggg////"
140 LOCATE 2,1:PRINT"+,-.cdefjklmrstu
jklmcdef+,-."
150 FOR I=6144 TO 6910 STEP 32:VPOKE
I,128:VPOKE I+1,128:VPOKE I+30,128:VP
OKE I+31,128:NEXT I
160 FOR I=674 TO 701:VPOKE6144+I,33:N
EXT I
170 FOR I=738 TO 765:VPOKE6144+I,33:N
EXT I
180 LOCATE 2,4:PRINTSTRING$(28,35)
190 LOCATE A,20:PRINT" * ":LOCATE 2,2
2:PRINT"SHOTS)))))))))))))))))))))))"
200 A$=MID$(A$,4,39)+MID$(A$,1,3):B$=
MID$(B$,27,2)+MID$(B$,1,26):C$=MID$(C
$,3,26)+MID$(C$,1,2):D$=MID$(D$,28,1)
+MID$(D$,1,27)
210 LOCATE 2,3:PRINTMID$(A$,1,28)
220 LOCATE 2,7:PRINTB$
230 LOCATE 2,10:PRINTC$
240 LOCATE 2,13:PRINTD$
250 K=STICK(0):A=A-(K=3 AND A<27)+(K=
7 AND A>2):LOCATE A,20:PRINT" * "
260 IF NOT STRIG(0)THEN FOR DL=1 TO 8
0:NEXT DL:GOTO 330
270 SOUND 0,0:SOUND6,20:SOUND7,199:SO
UND8,16:SOUND12,2:SOUND13,3
280 FOR I=19 TO 5 STEP-4:LOCATE A+1,I
:PRINTCHR$(120):NEXT I:FOR I=7 TO 19
STEP 4:LOCATE A+1,I:PRINT" ":NEXT I:S
H=SH-1:IF SH<30 THEN LOCATE SH,22:PRI
NT" "
290 IF MID$(D$,A,1)<>" " THEN MID$(D$
,A,1)=" ":BEEP:S=S+5:LOCATE 2,13:PRIN
TD$:GOTO 330
300 IF MID$(C$,A,1)<>" " THEN MID$(C$
,A,1)=" ":BEEP:S=S+5:LOCATE 2,10:PRIN
TC$:GOTO 330
310 IF MID$(B$,A,1)<>" " THEN MID$(B$
,A,1)=" ":BEEP:S=S+5:LOCATE 2,7:PRINT
B$:GOTO 330
320 IF MID$(A$,A,1)="`"OR MID$(A$,A,1
)="h"THEN MID$(A$,A-1,3)="   ":BEEP:S
=S+10:LOCATE 2,3:PRINTMID$(A$,1,28)
330 IF A$=Z$ THEN S=S+50:LOCATE A+1,2
0:PRINT" ":GOTO 80
340 IF SH>7 THEN 200
350 COLOR 14,1,1:CLS:LOCATE 4,10:PRIN
T"YOU RAN OUT OF AMMUNITION"
360 LOCATE 6,15:PRINT"YOUR POINTS WER
E ";S
370 FOR DL=1 TO 750:NEXT DL
380 LOCATE 2,20:PRINT"PRESS SPACE BAR
 TO PLAY AGAIN"
390 IF NOT STRIG(0)THEN 390 ELSE CLS:
GOTO 50
400 M=0:FOR I=1 TO 39:READ CH,CH$
410 FOR CD=1 TO LEN(CH$)STEP 2
420 VPOKE 8*CH+M,VAL("&H"+MID$(CH$,CD
,2)):M=M+1:NEXT CD:M=0:NEXT I
430 RETURN
440 DATA 33,FF01FF80FF01FF00,35,EAAAA
AAAAAAAAABA,40,3C7EC3DFC3FB423C,41,00
183C3C3C3C3C00,42,0018183C3C7E7EDB,43
,FFFF7F1F07010000,44,FFFFFFFFFFFF7F0F
450 DATA 45,FFFFFFFFFFFFFEF0,46,FFFFF
EF8E0800000,47,FFFFFFFFFFFFFFFF,96,01
037E0E7F030000,97,3C7EC3DFC3FB423C,99
,FFFF7F1F07010000,100,FFFFFFFFFFFF7F0
F
460 DATA 101,FFFFFFFFFFFFFEF0,102,FFF
FFEF8E0800000,103,FFFFFFFFFFFFFFFF,10
4,F0FC7E7EFEFCF000,105,3C7EC3DFC3FB42
3C,106,FFFF7F1F07010000,107,FFFFFFFFF
FFF7F0F
470 DATA 108,FFFFFFFFFFFFFEF0,109,FFF
FFEF8E0800000,110,FFFFFFFFFFFFFFFF,11
3,3C7EC3DFC3FB423C,114,FFFF7F1F070100
00,115,FFFFFFFFFFFF7F0F,116,FFFFFFFFF
FFFFEF0
480 DATA 117,FFFFFEF8E0800000,118,FFF
FFFFFFFFFFFFF,120,1010101010101010,12
8,9999999999999999
490 CLS:LOCATE 10,0:PRINT"INSTRUCTION
S":PRINTTAB(10);"############":PRINT
500 PRINT" YOU HAVE TO TRY AND SHOOT
DOWN THE DUCKS THAT ARE PARTLY HIDING
     AT THE TOP OF THE SCREEN":PRINT
510 PRINT"YOU GET FIVE POINTS IF YOU
HIT ABALLOON OR TEN POINTS IF A DUCK"
:PRINT
520 PRINT"IF YOU HIT ALL THE DUCKS AN
OTHERSIX DUCKS WILL APPEAR AND FIFTY
 POINTS ARE ADDED TO YOUR TOTAL":PRIN
T
530 PRINT" YOU HAVE A MAXIMUM OF 40 S
HOTS":PRINT:PRINT"USE THE CURSOR KEYS
 TO MOVE YOUR  GUN AND THE SPACE BAR
TO FIRE":PRINT:PRINT
540 PRINTTAB(5);"PRESS SPACE BAR TO P
LAY"
550 IF NOT STRIG(0)THEN 550 ELSE CLS:
RETURN
560 SCREEN 2:COLOR 15,4,4
```



CREDIT CARD SOFTWARE IS HERE!
THE ASTRON SOFTCARD FOR MSX COMPUTERS.

THE STORY SO FAR

Over the next eight pages we take a look at each of the MSX micros available in the UK to date



It's only a year since MSX micros first appeared in Britain and already eleven different machines inhabit computer departments all over the country. MSX is proving itself as a force to be reckoned with in the home computer field and is definitely here to stay.

Although all machines have been constructed to satisfy a set of minimum MSX requirements, the variations in design, appearance, specifications and price is so great that eleven unique-looking machines have been produced. It's now possible to choose a computer as if you were buying a dress or a suit.

Take the Sony Hit Bit, an elegant stylish machine. It is the only one to incorporate a 16K ROM chip containing an address book program and is also one of only two MSX micros to include an RGB socket, invaluable if you intend to take advantage of the quality displays generated by an RGB monitor. JVC's HC-7 is the other one. Toshiba's HX-10, on the other hand, sticks to a fairly standard configuration.

Variations

Design variations lie in the inclusion of lightpen holders, either one or two cartridge ports, reset buttons, numeric keypads, music synthesiser chips and even small things such as the feel of the keyboard, function key size or colour schemes.

The machines appear to be so different that there is one to suit every personality and pocket. Prices range from £139 for the Goldstar FC-200 to £299 for the Sony Hit Bit and Sanyo MCP-100.

Competition between the machines is inevitable and Mitsubishi in particular has made great efforts to make its machines attractive with substantial price reductions, free quality software packs and even an offer to take £50 off the machine's price in exchange for your old computer.

Great bargains exist in shops such as Underwoods and Dixons where, for example, the Sony Hit Bit and Panasonic CF-2700 have been reduced to £99. These offers are regional and only exist while stocks last.

The next wave of MSX computers is starting to arrive in the country, such as Spectravideo's X'Press, Toshiba's HX-22 and Pioneer's CX-7.

Like the Yamaha with its inbuilt FM synthesiser chip, each one is respectively individualised with special features such as built-in disk drives, word processors and P-BASIC (a graphics language enabling the machine to control video images and superimpose text and graphics on screen), while still conforming to MSX standards.

To help you make an informed choice, we've summarised the eleven existing MSX computers. Some excellent bargains can be found so look around before parting with any hard-earned cash.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM64K ROM32K MSXBASIC VIDEORAM 64K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 1 expansion bus 1 cartridge port 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	400 × 260 × 63mm W × D × H
WEIGHT	4.7Kg
SOFTWARE INCLUDED	1 Vacuumania game Demonstration program
ACCESSORIES	1 RF cable 1 cassette cable Operating manual MSX BASIC manual
DISTRIBUTOR	Spectrum 500 Hunting Gate Hitchin Herts SG4 0TJ

GOLDSTAR FC-200 £139

Although the Goldstar FC-200 lacks some of the panache, dash and sophisticated good looks of some of the other MSX micros, the emphasis is on value for money and durability.

A £139 price tag makes it one of the cheapest of the MSX machines, but the cost has nothing to do with inferior quality. All machines are imported from Korea where labour costs are so low that British distributors can afford to keep prices down.

No 'Design of the Year' awards will be won by the Goldstar, but we've found it to be durable and very usable. A common MSX fault is a breakdown in the video or joystick port connections, but our office Goldstar has never suffered these or any other ailments.

The Goldstar is a colourful computer with a two tone light and dark grey casing, off-white alphanumeric keys and a selection of multi-coloured function keys; red STOP key, green CODE and GRAPH keys and a bright blue cursor keypad. LEDs indicate whether the CAPS LOCK or CODE keys are activated. Programming is made easy with these colourful aids.

Interfaces on the machine, apart from the lightpen holder and the absence of a reset button, present no surprises. Unfortunately a 50 pin expansion bus—virtually useless as the majority of peripherals use the cartridge-type connector — has been fitted.

Inexpensive

The alphanumeric keys are perfect for word processing; the keys are springy and have a roughened surface with a grip good enough for touch typing. But the small RETURN key is a disappointment as is the absence of a £ sign.

When the MSX micros were first launched, the FC-200 was the cheapest, but now the situation has changed and some of the other MSX manufacturers are slashing their prices— it might be advisable for Goldstar to follow suit.

JVC HC-7 £99

JVC has always kept itself at the higher end of the consumer electronics market with top quality products such as TVs, hi-fis and video recorders that not only feel and look good, but more importantly are good. The HC-7, like everything else from JVC, is a sleek, well constructed, good looking computer.

A silver and dark grey casing, with an unusually high rear section characterises this micro. The alphanumeric keys are off-white, but unfortunately the function keys are all the same grey as the casing— the lack of differentiation can lead to mistakes, particularly when programming.

All the usual interfaces and sockets are included on the machine plus a few more. It is one of the few with a reset button, but this is placed at the back where it's difficult to reach.

More important is the addition of the RGB monitor socket. This welcome extra enables the machine to link up to an RGB monitor producing a clear, flicker-free colour image on screen (see the monitors section on page 91).

Protective plastic coverings for the vulnerable joystick ports illustrates the kind of care JVC takes over its products.

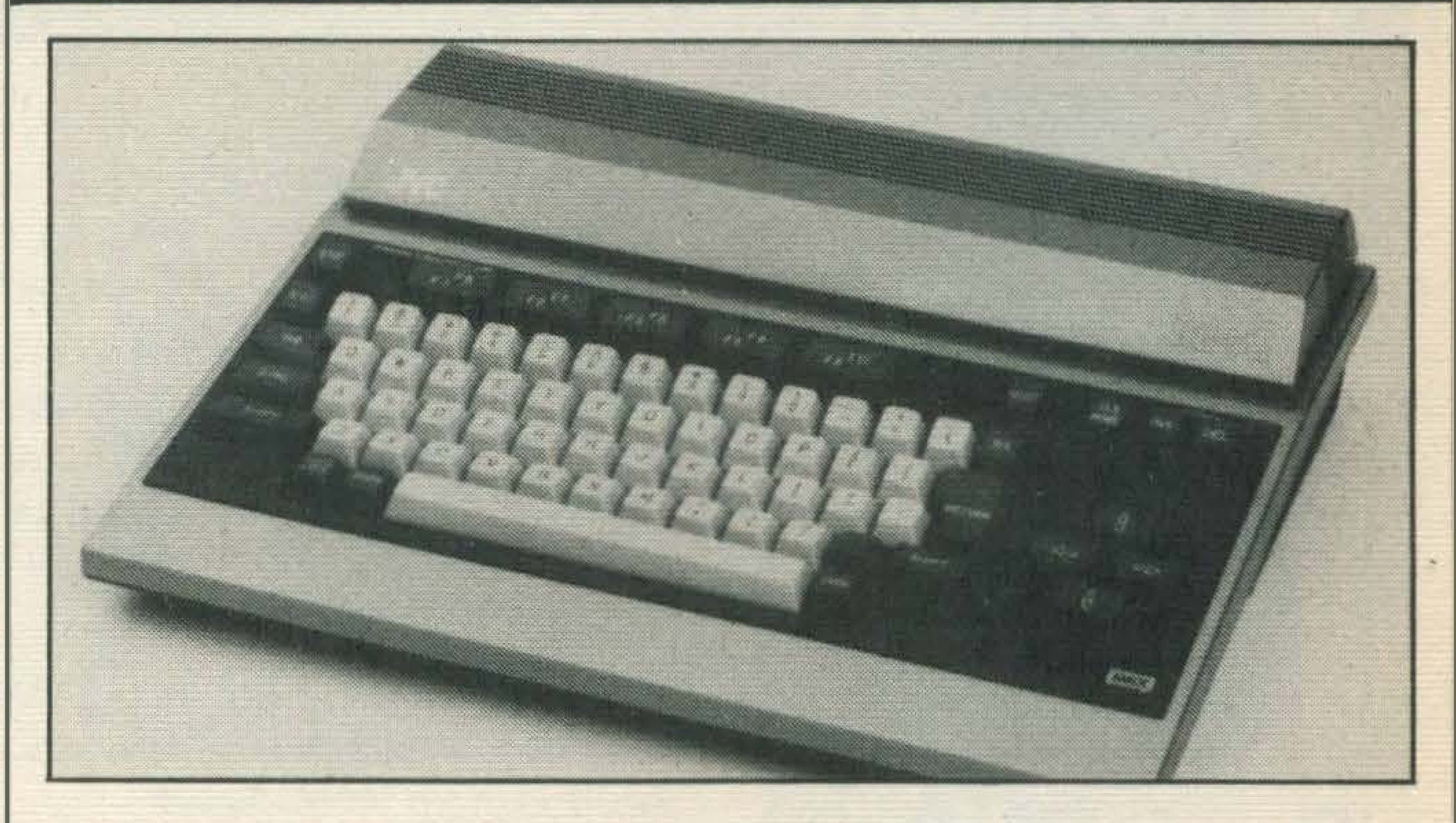
Ideal

Its steep sloping keyboard is not to everyone's liking, but this together with the slightly scalloped keys and large RETURN key makes it ideal for word processing.

JVC also has a number of smart MSX peripherals on the market; an £89 data recorder, a £12.95 joystick and will be releasing the first MSX MIDI interface together with software at the end of November. This device has tremendous opportunities in the music world.

The HC-7's main strength is that it is the product of a well-established company holding an impressive record for good quality products. It's also a well-designed, attractive computer.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, RGB monitor Mono audio
SOUND	3 channels 8 octaves
KEYBOARD	49 alphanumeric keys, 24 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	Yes
DIMENSIONS	382 × 286 × 87.5mm W × D × H
WEIGHT	2.8Kg
SOFTWARE INCLUDED	None
ACCESSORIES	1 cassette cable 1 RF cable Operating manual
DISTRIBUTOR	JVC (UK) Ltd Eldon Wall Trading Estate Priestley Way London NW2 7BA Tel: 01-450 2621

MITSUBISHI ML-F48 £79

Mitsubishi has taken a calculated gamble importing the 32K ML-F48 into a British home computer market where the 64K micro rules OK.

In Japan, 32K, 16K and even 8K MSX computers have been selling like hot cakes, the 64K computer being the rarity rather than the norm as in Britain.

Where the British public seems to be obsessed with the need for 64K memory, even if they never intend to use it.

The shortage of memory doesn't seem to bother the Japanese buyers and there is no reason why it should bother us. With the exception of Melbourne Houses's adventure game, *The Hobbit*, this machine has loaded every other program we have tried with it. There is also no disadvantage to BASIC programmers as it has virtually the same BASIC memory as a 64K computer.

Problems will arise if you need to save vast quantities of machine code programming or intend to use MSX-DOS and CP/M software — but extra memory can always be obtained from cartridge RAM packs.

Lookswise the machine is a snappy metallic silver and black with off-white alphanumeric and grey function keys. Some of the function keys are too small, but the cursor keypad is one of the best. The keyboard has a solid feel and presents no problems for word processing.

All the usual sockets and ports are arranged around the machine including two cartridge ports, two joystick ports, a centronics printer port and the 8-pin DIN cassette port, but there is no reset button.

Competitive

At £79, the Mitubishi ML-F48 is one of the most competively priced of the MSX micros, but potential buyers should consider the identically priced Toshiba before investing, because although ot is less stylish, it does have the full 64K memory.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 32K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	370 × 270 × 70mm W × D × H
WEIGHT	2.7Kg
SOFTWARE INCLUDED	Demo + 2 games
ACCESSORIES	1 RF cable 1 cassette lead Instruction manual
DISTRIBUTOR	Mitsubishi Electric Otterspool Way Watford, Herts Tel: (0923) 770000

MITSUBISHI ML-F80 £99

In contrast to the snappy 32K ML-F48, Mitsubishi's 64K computer, the ML-F80 is a rather staid, solid looking computer.

No risks have been taken with this rather unstimulating micro; no unusual design features, no outrageous colour schemes, no special interfaces. But, it does incorporate all the compulsory MSX features to produce a reliable, non-pretentious MSX computer.

The casing is unexciting, in black and grey, livened up only with the Mitsubishi logo. Off-white alphanumeric and pale grey function keys make up the keyboard. But while the appearance isn't exactly exuberant, it is neat and business-like.

Nothing is lacking on the socket and interface front; everything is as it should be and in keeping with the non-innovative style adopted by Mitsubishi for the machine.

Sloping slightly, the keyboard with its concave keys is good enough for word processing and rapid program entry, despite the keys' mushy feel, which occasionally makes it difficult to ascertain whether a particular letter has registered.

A chunky cursor keypad is ideal for games playing, although some people may dislike the distance between the four keys. Function keys are too small for comfort.

Although, the Mitsubishi ML-F80 is not as stylish as some of the other machines such as the Canon and Panasonic, it is a good solid computer.

Good Value

Mitsubishi have only recently cut the price of this machine from £275 to £99 — a fantastic price drop. Bargain hunters should be thrilled, as it brings a new meaning to the words 'real value for money'.

However, despite the price drops, it still remains to be seen whether the fashion conscious British public will be swayed from choosing a more stylish machine.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	370 × 270 × 70mm W × D × H
WEIGHT	2.7Kg
SOFTWARE INCLUDED	Demo + 2 games
ACCESSORIES	1 RF cable 1 cassette lead Instruction manual
DISTRIBUTOR	Mitsubishi Electric (UK) Ltd Otterspool Way, Watford, Herts Tel: (0923) 770000

PANASONIC CF-2700 £311

Smart, aggressive and distinctive, the Panasonic stands out in a crowd. Where most manufacturers have been content to go for a conservative style Panasonic has dared to be different.

At £311 it is one of the most expensive computers, but don't pay that much because if you look around, you'll probably find a number of these micros selling for £99.

Larger than any of the other MSX micros, its size and the impressive matt black casing give this machine its handsome business-like looks. The keyboard is a combination of dark and pale keys contrasting with the green lettering of the Panasonic logo and cursor arrow keys.

Two cartridge slots, handily situated on the top, together with the familiar MSX socket and interface arrangements means that no out-of-the-ordinary connections are included on this micro.

The cursor keypad is ideal for games, but a few of the function keys are far too thin for effective programming. On the other hand, the alphanumeric keys are ideal for word processing with their slightly scallopped surface and solid feel. It also has a large RETURN key.

As well as the usual RF and cassette leads, the CF2700 comes with two other useful cables; video and audio. A few dealers are supplying free Panasonic cartridge games with the machines, but that's not standard practice.

Nice Idea

A sheet of graphic labels — for sticking on the relevant keys — is also supplied. This is a nice idea — stick them to the keys and you won't have to refer to manuals to find out how to get musical or other special characters by means of pressing the GRAPH key simultaneously.

Panasonic's design team has interpreted MSX's requirements well on this computer, but it's a shame nothing new has been incorporated.

SPECIFICATIONS



CPU	Z80A 3.6 MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	426 × 249 × 91mm W × D × H
WEIGHT	3.5Kg
SOFTWARE INCLUDED	None
ACCESSORIES	1 RF cable, 1 video cable, 1 audio cable 1 cassette lead Instruction manual BASIC manual Sheet of graphic labels
DISTRIBUTOR	Panasonic (UK) Ltd 300-318 Bath Road Slough, Berks SL1 6JB

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	Yes
DIMENSIONS	385 × 240 × 63mm W × D × H
WEIGHT	2.2Kg
SOFTWARE INCLUDED	3 cassettes (demonstration program, 2 games, 2 educational)
ACCESSORIES	1 RF cable 1 cassette lead Instruction manual
DISTRIBUTOR	Sanyo Marubeni (UK) Sanyo House, 8 Greycaine Road, Watford, Herts Tel: (0923) 46363

SANYO MPC-100 £299

Computers are nothing new to Sanyo. It's been producing 8- and 16-bit business machines for some time and is one of the only MSX-manufacturing companies to have past experience in computers. It even has its own computer dedicated factory.

With its business computer background, Sanyo naturally opted for a professional, business-like style for its machine. One of the lightest of the MSX micros, the MPC-100 is a flattish, slim machine with an attractive silver and black case — none of the fancy colours and shades incorporated into some of the others.

In fact some shading would be desirable as the function and alphanumeric keys are all completely black making it fairly easy to press the wrong ones. Key layout is much the same as on other machines, although it has some nice traits; largish RETURN and function keys, and a solidly constructed cursor keypad.

Key response is firm and positive, just right for trouble-free word processing and inputting long programs.

Sockets and ports are standard, although there are two extra features; a reset button and light pen holder which is rather suitable as Sanyo manufactures the only available MSX lightpen, the MLP-001 for £90.

Solid

Overall finish of the machine is almost faultless; it looks great, is solidly constructed, works well, but for £299 we can't help feeling there should be something else, an RGB output perhaps.

While some of the other MSX manufacturers are bringing prices down. Sanyo is still sticking with its original price, although some dealers are selling them for a lot less.

Sanyo's MPC-100 is a well built solid machine, but has nothing to distinguish it from the crowd. If you can get hold of one at cut price, though, it is definitely well worth the money.

SONY HB-75 £299

Akio Morita, Sony's jet-setting chief executive is responsible for many of Sony's successes in the consumer electronic world. His innovative ideas and foresight have influenced many of Sony's products and by the looks of the Sony Hit Bit, he's had a hand in that as well.

Of all the MSX micros reviewed here, Sony's Hit Bit is probably the best interpretation of the MSX standard. It incorporates all the MSX essential features plus a few extras, including a 16K ROM chip (in addition to the ROM with 32K MSX BASIC) containing an organiser program.

This chip provides four extra options to the usual blue and white MSX BASIC screen; Address, Schedule, Memo and Data Transfer. These functions operate together to produce a kind of computerised address book and diary.

It is probably the best looking of the machines with a smart jet black casing and a black and grey keyboard. Function keys are too small and the cursor keys occasionally get stuck underneath the casing, but on the plus side, the keys respond smoothly and positively during word processing and the RETURN key is one of the biggest.

In addition to the usual interfaces, a RGB socket for monitors and a red reset switch positioned on the keyboard are included on the machine.

Elegance

Sony, in keeping with its daring reputation, was one of the first companies to bring in a £350 3.5 inch disk drive as well as a £40 4K data cartridge offering an extra storage facility.

Sony's Hit Bit shows the rest of the MSX micros what the MSX standard could be. It combines style and elegance with a business-like professional appearance. The inclusion of that built-in address book system makes it a high class family computer — it is pricey, but it's worth it, especially when you consider some of the discounts now available.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, Composite video monitor, RGB monitor Mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 25 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	Yes
DIMENSIONS	400 × 245 × 66mm W × D × H
WEIGHT	3Kg
SOFTWARE INCLUDED	Inbuilt address book system
ACCESSORIES	1 RF cable 1 cassette lead Instruction manual
DISTRIBUTOR	Sony (UK) Ltd Sony House, South Street, Staines, Middlesex

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, Composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	64 alphanumeric keys, 22 function keys, cursor keys Numeric keypad
INTERFACES	2 joystick ports 1 expansion bus 1 cartridge port 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	405 × 215 × 72mm W × D × H
WEIGHT	2.3Kg
SOFTWARE INCLUDED	None
ACCESSORIES	1 RF cable, 1 audio cable, power supply Instruction manual
DISTRIBUTOR	Spectravideo Ltd 165 Garth Road, Morden Surrey SM4 4LH

SPECTRAVIDEO SV1-728 £199

One of the first companies to develop an MSX BASIC-type language, Spectravideo used a version of it in two of its computers, the SV1-318 and SV1-328. These, although not full MSX machines, were used by many companies to develop MSX software.

Spectravideo's SV1-728 was one of the first MSX machines to arrive in the country and is a visually distinctive machine. It has an off-white casing, a two-tone grey keyboard and a numeric keypad, a feature not included on any of the other MSX machines.

Right from the start, Spectravideo aimed its machine at the business end of the MSX market, a strategy confirmed by the company's latest MSX import, the X'Press costing £400. (See page 75 for more information.)

The keyboard is unusual; arrowed keys instead of the usual chunky cursor keypad, a number of extra keys (some containing LED lights) and the numeric keypad which contributes to the unusually large amount of alphanumeric keys. In effect the keyboard is cluttered, although the keys are firm and bouncy enough for word processing.

It has all the usual interfaces, but unfortunately a (currently) virtually useless expansion bus has been installed rather than a second cartridge port.

Another noticeable feature is its external transformer — most of the MSX micros incorporate these internally.

Spectravideo has deliberately discouraged games players by omitting a distinctive RETURN key and cursor keypad.

Spectravideo decided not to cut the price of its SV1-728 and rather than join in the price cutting spree, stopped importing the computers into Britain (there are still a few in the shops), prefering to spend its time on the X'Press.

TOSHIBA HX-10 £79

Very similar in appearance to the Goldstar, Toshiba's HX-10 is a colourful, compact computer. It contains no features other than those specified as the standard MSX requirements and this has probably helped Toshiba to reduce the price tag, formerly £239, to £79.

Colourful in dark and light grey, and almost covered by a ventilation grille, the HX-10 is one of the smallest of the MSX micros.

Alphanumeric keys are the usual off-white, but the function keys are a multi-coloured affair; most of them are dark grey, but the cursor keypad is bright blue, the STOP key is red and the GRAPH key, a vivid green.

Toshiba has aimed its machine at home users, putting the emphasis on games with the huge RETURN key and lively cursor keypad. Keystroke is a little too shallow for large amounts of work processing, but the function keys are well placed and large enough to facilitate long hours of programming. It has no reset button.

A slight problem is the backspace key which is rather small for something that is used so often.

Interfaces and socket connections hold no surprises, except that a less-than-useful expansion bus has unfortunately replaced the second cartridge port.

Price

Toshiba's £79 price tag is extremely attractive, and the £99 'kit' which includes a data recorder, software, manual, plugs and screwdriver, is even more so.

Toshiba has worked to produce a computer that satisfies the minimum MSX requirements cheaply and effeciently. It is the Mr Average of all the MSX computers; squat, square and fairly unexciting. Still, £79 is just about the cheapest you'll pay for an MSX computer in the UK — it's definitely not a price to be sniffed at.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 1 expansion bus 1 cartridge port 1 Centronics printer port, 18-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	370 × 245 × 60mm W × D × H
WEIGHT	2.8Kg
SOFTWARE INCLUDED	1 demonstration cassette, French is Fun, Hunchback and Manic Miner
ACCESSORIES	1 RF cable 1 cassette lead Instruction manual BASIC manual
DISTRIBUTOR	Toshiba (UK) Ltd Frimley Road, Frimley, Camberley, Surrey GU16 5JJ

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 32K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio 2 stereo phone jacks 2 MINI DIN sockets
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor key pad
INTERFACES	2 joystick ports 1 expansion bus 1 cartridge port Centronics printer port, 18-pin DIN cassette port keyboard socket
RESET BUTTON	No
DIMENSIONS	422 × 207 × 68mm W × D × H
WEIGHT	2.7Kg
SOFTWARE INCLUDED	FM music synthesiser
ACCESSORIES	1 RF cable 1 cassette cable 2 instruction manuals
DISTRIBUTOR	Yamaha Kemble Music (UK) Ltd Mount Avenue, Bletchley, Milton Keynes MK1 1JE Tel: (0908) 71771

YAMAHA CX-5M £299

When the MSX computer standard was first announced, it was heralded as being just part of a new concept in home entertainment. So far, Yamaha is the only company to have fulfilled that claim, although the Pioneer is soon to offer more with its interactive video system.

The CX5M is not just a computer, but also a music synthesizer. The secret to the CX5M's dual function is its built in synth, the FM Sound Synthesizer. FM stands for Frequency Modulation and refers to the way sounds are generated.

A keyboard is needed to take advantage of the synthesizer's ability, putting the system's price up by £85 or £165 for Yamaha's Mini and Standard keyboards respectively.

With its slim stylish black casing and black and grey keyboard, Yamaha's computer looks superb. Unfortunately it has only 32K of user memory and just one cartridge port. Still, most people will be buying it for the musical capabilities, so these shortcomings won't matter too much.

The internal synthesizer has a number of features: up to eight sounds can be generated; it provides a preset range of 46 voices covering everything from woodwind to bells, train noises and percussion. Solo bass and rhythm chords can be generated to accompany the music. In short, sophisticated music can be composed with the minimum of effort.

Versatile

Other cartridge programs available for use with the synth are the *Music Composer*, two voicing programs and a *Music Macro*, all at £36. Accompanying manuals explain everything clearly and precisely.

As an MSX computer, the CX5M has a few shortcomings, but as a synthesiser for the home or even a music studio, it is a versatile, easy-to-use music making machine. If you're musically inclined, give it more than a second look.

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The CX5M is also a tremendous tool for composers or arrangers. You can compose music right on the monitor screen, entering notes from the computer keyboard or directly from the music keyboard. You can arrange your composition for up to 8 parts, using the pre-programmed FM voices or ones you have programmed yourself. Compose, arrange and rearrange with ease — and hear the results immediately. A built-in MIDI interface also makes it possible to use the CX5M as a sophisticated sequencer to control MIDI compatible synthesizers, drum machines and other instruments.
There's some really good news for DX7 synthesizer owners, too. The CX5M allows you to program your DX synthesizer via the MIDI interface, with full on-screen parameter display— including graph-type envelope generator waveforms so you can SEE what you're programming.
The CX5M is a virtually indispensable tool for today's musician. And with the constantly expanding line of Yamaha CX5M music software, not to mention the increasing range of instruments that support MIDI control, it's a tool that will continue to grow in importance in virtually all music-related fields.

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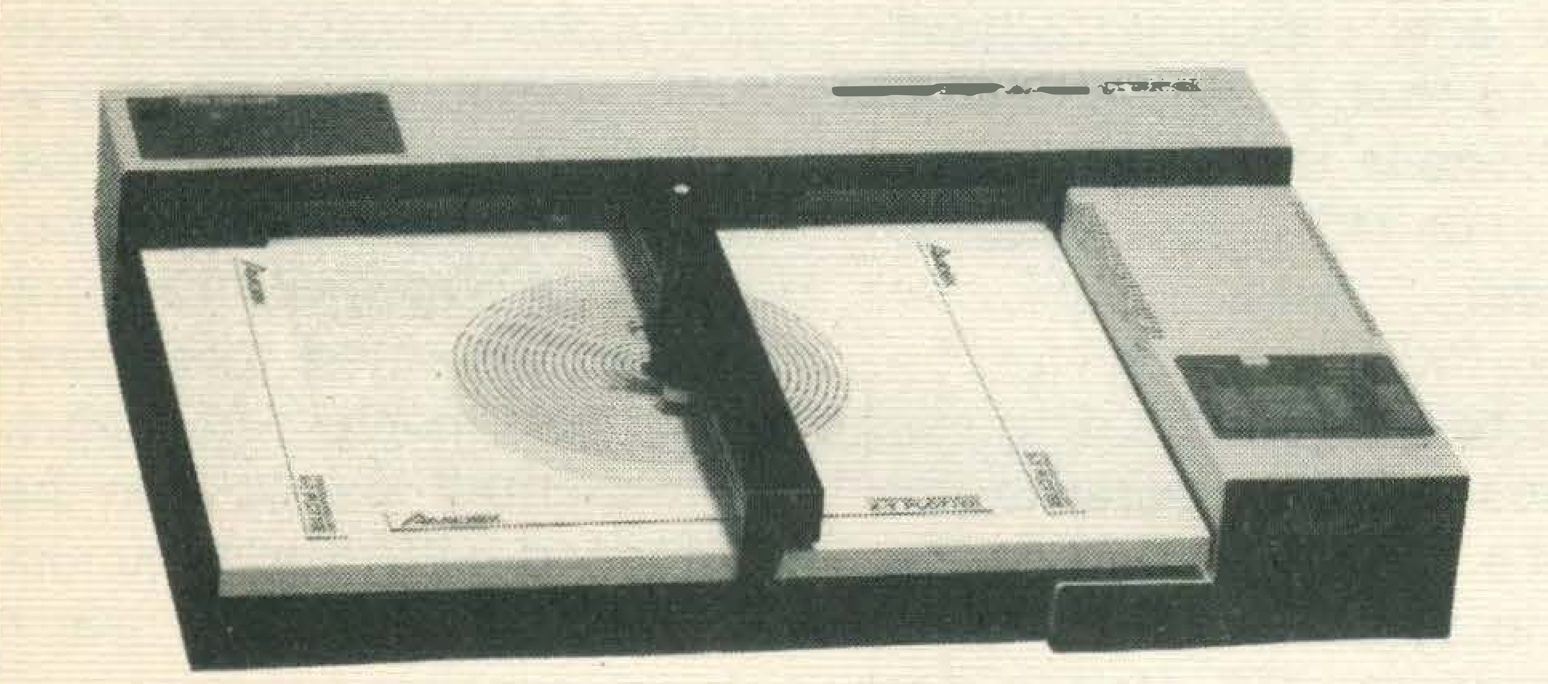
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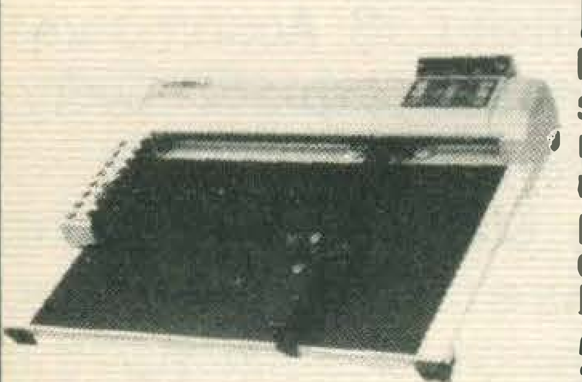


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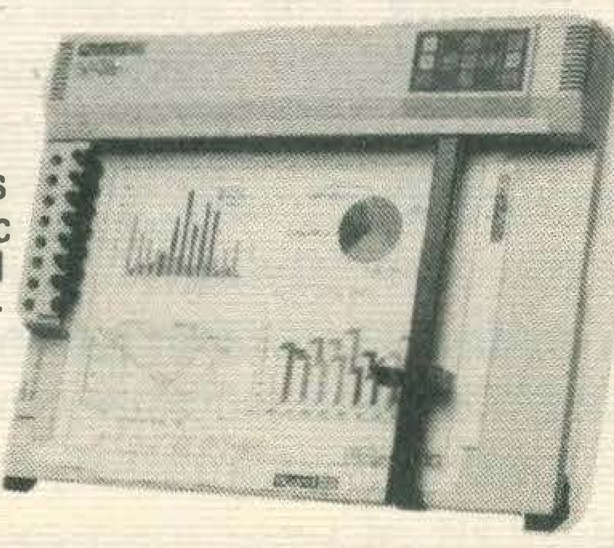
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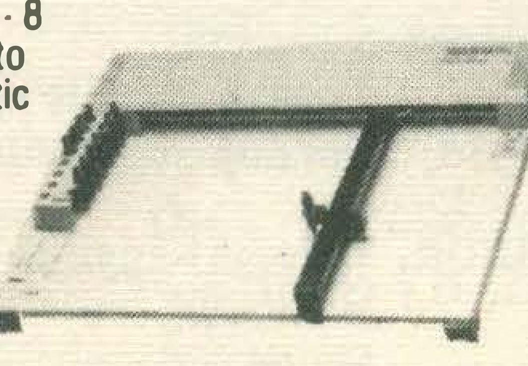
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What MSX

CANON V-20 £280

Stylishly chunky— that's probably the best way of describing the Canon V-20. The sleek black case, adorned with the orange and white Canon logo, and the mixture of dark and pale grey keys combine to give this machine a modish professional look.

Noticeable features on the Canon are its huge cursor keys and the array of large function keys across the top. These would be perfect for programming and especially for games play, but unfortunately, favourable first impressions are let down a little by the keyboard's feel.

Key response is spongy and they click when pressed. When handled, the keys together with the casing feel cheap and 'plasticy'. Word processing large quantities of text can be trying, particularly as the space bar is a little short. The RETURN key, however, is large and well-placed for typists.

Unusual features include the plastic protective covering on the two cartridge ports and the clever positioning of the two joystick ports at the front of the machine — the usual location on an MSX micro is at the side.

A reset button is absent from the Canon, but the back of the micro contains the usual array of interface ports; Centronics printer, 8-pin DIN cassette and the video, audio and RF (for connection to TVs) phono sockets.

Costly

No software or special offers accompany the micro, which at £280 is costly. The introduction manuals are the standard MSX offering and teach first time users to do things such as connect the machine to a TV and a bit of MSX BASIC programming.

Rounded corners, a smart colour scheme and well placed ventilation shafts give this machine its good looks, but the beauty is just a little skin deep.

If you like playing games, especially the *Track and Field* variety, the Canon's huge cursor keys are absolutely ideal, but £280 is a lot to pay for a games playing machine only.

SPECIFICATIONS



CPU	Z80A 3.6MHz clock
MEMORY	RAM 64K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines Resolution: 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 21 function keys, cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port, 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	397 × 218 × 60mm W × D × H
WEIGHT	2.4Kg
SOFTWARE INCLUDED	None
ACCESSORIES	1 video cable 1 audio cable Instruction manuals
DISTRIBUTOR	Canon (UK) Ltd Manor Road Wallington Surrey SM6 0AJ Tel: 01-773 3173

SPECTRAVIDEO X'PRESS £399

We've a long way to go before the second generation of MSX micros hits the high streets, but Spectravideo seems to be heading in the right direction with its latest model, the X'Press.

The machine comes with a host of extras that makes it ideal for the low-end business user.

The most noticeable of these is the built-in 3.5 inch disk drive, which is perhaps the most important addition, as disk drives on their own can cost anything up to £350.

Other additions are the 80 column card and a built-in RS232C socket, but as this isn't a standard socket you're going to have to make up your own lead if you want to connect it to a modem, serial printer or some other peripheral.

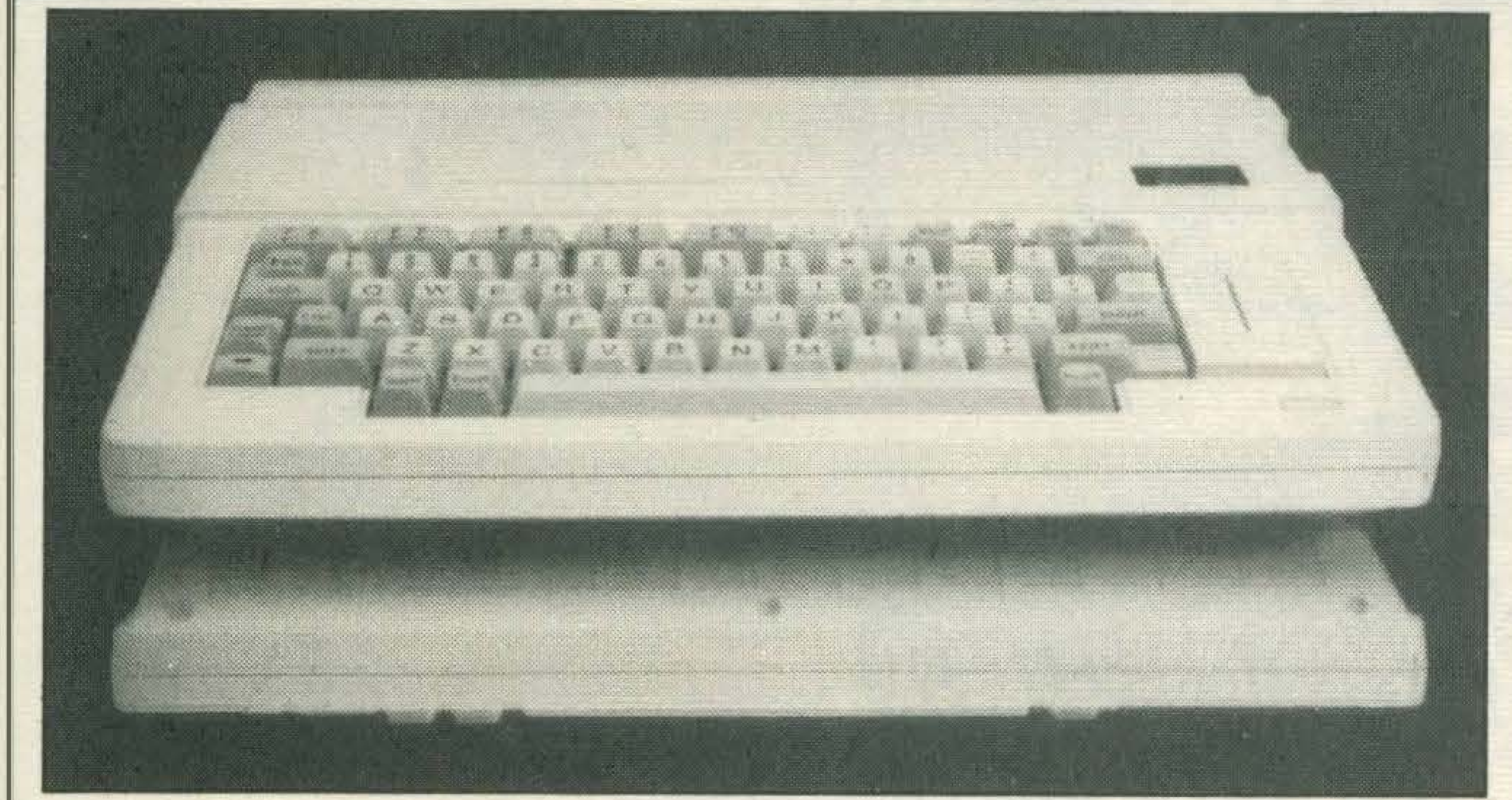
The X'Press's keyboard certainly looks good, but to be honest we had a few problems using it. Partly because there's no colour coding for the various sets of keys and also because some of the keys are too small, particularly the ENTER key.

Like most other micros the X'Press comes with its own software, namely two system disks for MSX-DOS and CP/M version 2.2. If you switch the micro on with either of these disks in the drive, the computer automatically boots-up into the operating system. When there's no disk in the drive, the micro defaults to MSX BASIC plus MSX disk BASIC, which is built into the machine.

Such facilities are an obvious boon to potential small business users because of the enormous amount of business software which becomes compatible.

All in all the X'Press is a very impressive machine. The only problem we can see is getting hold of it. Spectravideo is still vague about the launch date, which is a pity because it's a very versatile micro with a very attractive price tag.

SPECIFICATIONS



CPU	Z80A equivalent (3.6MHz clock)
MEMORY	RAM 32K ROM 32K MSX BASIC VIDEO RAM 16K
VIDEO DISPLAY	Standard MSX mode (40 cols × 24 lines) Plus 80 column mode 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, Mono audio
SOUND	3 channels 8 octaves
KEYBOARDS	48 alphanumeric keys 21 control keys Cursor keypad
INTERFACES	2 joystick ports 1 cartridge port 1 centronics printer port 1 RS232 serial port 1 8-pin DIN cassette port built-in disk drive
RESET BUTTON	No
DIMENSIONS	365 × 295 × 60mm
WEIGHT	2.3Kg
SOFTWARE INCLUDED	MSX-DOS system disk CP/M 2.2 system disk both with utilities
ACCESSORIES	RF cable CP/M manual MSX-DOS manual MSX disk BASIC manual MSX BASIC manual Computer manual
DISTRIBUTION	Spectravideo Ltd 165 Garth Road Morden Surrey Tel: 01-330 0101

PIONEER PX-7 £300

Pioneer's PX-7 is not just a computer, it's a whole new concept in home entertainment incorporating sound, vision and computer control, which, appropriately enough, Pioneer calls its 'Home Entertainment System'.

The PX-7 micro is a visual controller which can superimpose text and graphics using its extra graphics language, P-BASIC (Pioneer Video BASIC) and Pioneer is using this feature as its product's main selling point.

Using the PX-7 as the main nucleus, you can add on Pioneer's £500 laser disk player, £90 graphics tablet, a TV, hi-fi system, video camera and £600 'Bodysonic' chair.

With the P-BASIC language, it's possible to manipulate words and images on screen, on laser disk images or even on home movie films — it has tremendous potential for home, educational and industrial use.

Pioneer envisages a future world where everyone has more leisure time and reckons that its system will enable people to spend this time more creatively.

The PX-7 comes in two units, a box containing the Z-80 processor, P-BASIC, MSX BASIC and a host of interfaces and a standard MSX keyboard unit including three additional function keys.

Apart from its potential as a superb video controlling system, the PX-7 opens up a whole new games world — the interactive video games are unbelievably good. Playing *Strike Mission*, one of Pioneer's games, is like flying into one of the *Star Wars* space fighting scenes — so realistic, you emerge from the battle with sweat soaked hands.

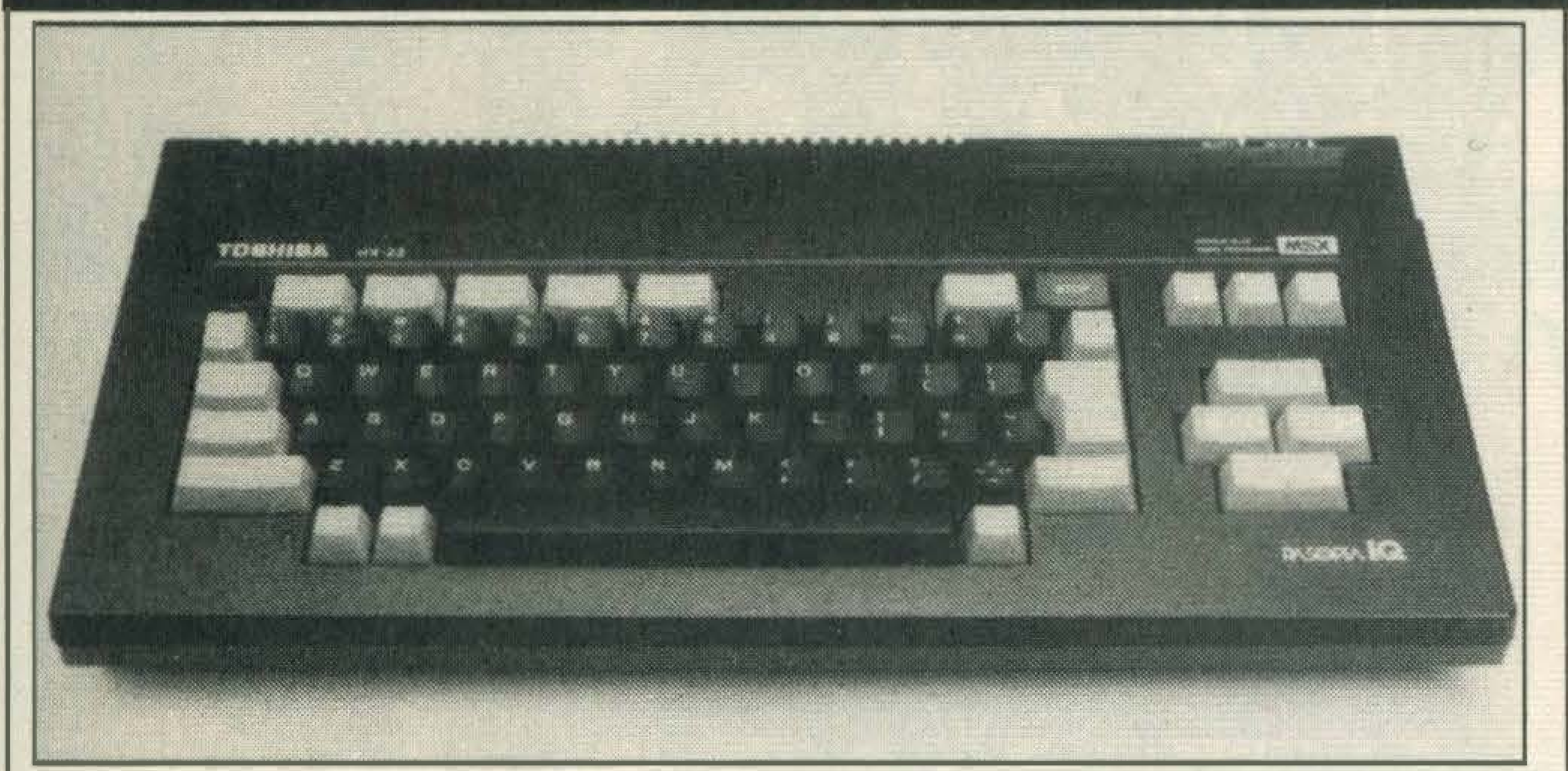
Pioneer is opening up a new dimension in home entertainment products, something claimed by all the MSX manufacturers and never fully realised. But it is costly and only time will tell if the public are ready for such innovative and interesting ideas.

SPECIFICATIONS



CPU	8-bit Z80A (3.58 MHz clock)
MEMORY	RAM 64K ROM 32K MSX BASIC 8K P-BASIC VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines resolution: 256 × 192 pixels 16 colours 256 sprites
OUTPUTS	TV, composite video monitor, RGB, mono audio, headphone socket
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys, 28 control keys, keypad cursor control
INTERFACES	2 joystick ports 2 cartridge ports 1 Centronics printer port 18-pin DIN cassette port 1 laser disc player port
RESET BUTTON	Yes
DIMENSIONS	420×171×47.5mm
SOFTWARE INCLUDED	None
ACCESSORIES	RF cable Instruction manual BASIC reference manual P-BASIC manual
DISTRIBUTOR	Pioneer High Fidelity 116 Field Way Greenford Middlesex Tel: 01-575 5757

SPECIFICATIONS



CPU	Z80A equivalent (3.6MHz clock)
MEMORY	RAM 64K ROM 32K MSX BASIC plus ROM software VIDEO RAM 16K
VIDEO DISPLAY	40 characters × 24 lines 256 × 192 pixels 16 colours 32 sprites
OUTPUTS	TV, composite video monitor, RGB monitor Mono audio
SOUND	3 channels 8 octaves
KEYBOARD	48 alphanumeric keys 21 control keys Cursor keypad
INTERFACES	2 joystick ports 2 cartridge ports 1 centronics printer port 1 RS232 serial port 1 8-pin DIN cassette port
RESET BUTTON	No
DIMENSIONS	420 × 220 × 75mm
WEIGHT	2.7Kg
SOFTWARE INCLUDED	Built-in word processor and communications software
ACCESSORIES	Instruction manual RF cable
DISTRIBUTOR	Toshiba (UK) Ltd Toshiba House Frimley Road Frimley, Camberley Surrey GU16 5JJ Tel: (0276) 62222

TOSHIBA HX-22 £249

The Toshiba HX-10, one of the most popular MSX micros, has now been joined by an upgraded version, the HX-22.

Externally it looks no different to any other MSX machine, but take a quick look at the I/O ports and you'll soon realise that there's more to this micro than meets the eye.

For a start there are two cartridge ports compared to the single slot on the HX-10 and there's an RS232 serial interface which uses an IBM-standard 25-pin DIN plug/socket combination.

The RGB socket is also a new addition and round on the side of the unit are two joystick 9-pin D connectors and the cassette interface.

As for the keyboard, it's a great improvement on the HX-10 — less sponge-like — but we found that it responded rather sluggishly and we often missed keys when getting up speed.

The beauty of the HX-22 is the built-in software; a word processor and communications software.

Selecting the word processor gives you a menu of eight options: writing (creating and editing) text; printing; loading from tape or disk; clearing out the memory; setting program variables; saving; and returning to MSX BASIC.

Needless to say the word processor is the best we've seen on MSX, and with the addition of a printer, you've got a very compact and powerful low-cost system.

In addition the RS232 is very attractive to users wanting a cheap way of logging on to bulletin boards and commercial databases.

Despite all the trimmings, the HX-22 isn't an MSX II — more of an MSX 1.5. But it is competitively priced and, compared to the likes of Sanyo's MPC-100 costing £299 and the Canon V-20, priced at £289, it is a very attractive bargain.

If the success of the HX-10 is anything to go by, we reckon that Toshiba is on to a winner as, to date, this is the best micro to come out of the MSX fold for main stream computer enthusiasts — we'll be watching its sales with very keen interest.

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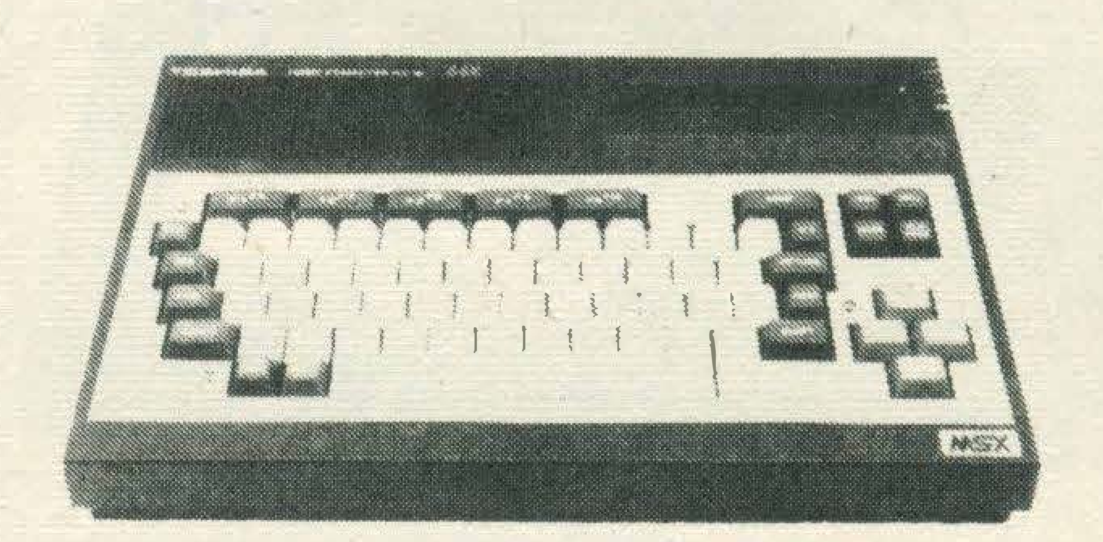
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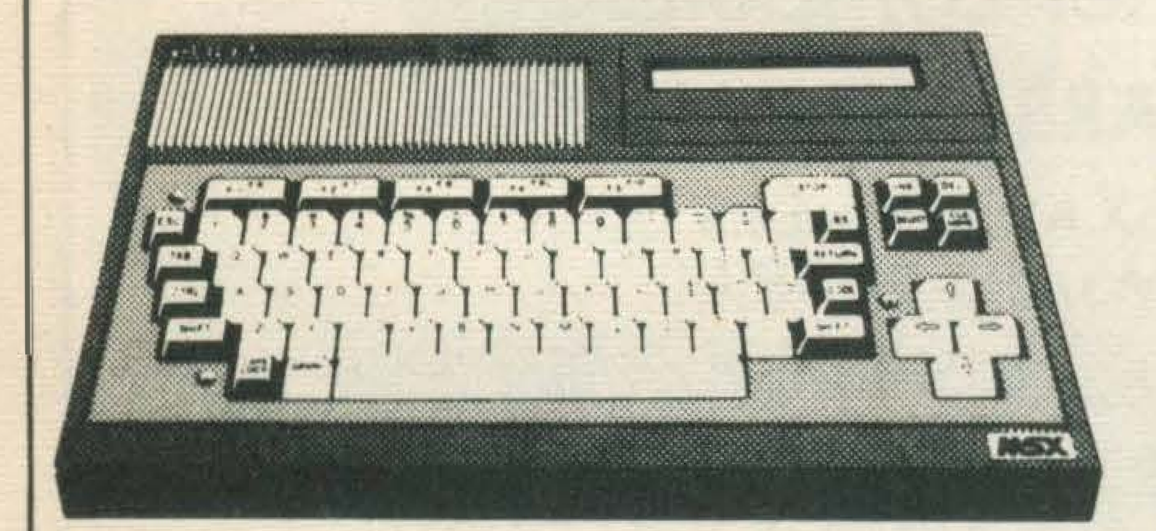


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Marylebone Rd
London NW1
01-486 7588

Alligata Software Ltd
1 Orange Street
Sheffield S1 4DW
(0742) 755796

Ampalsoft
PO Box 19
Knutsford
Cheshire WA16 OHE
(0565) 893563

Anirog Software
29 West Hill Dartford
Kent
(0322) 92513

Artic Computing Ltd
Main Street
Brandesburton
Driffield
Nth. Humberside
(0401) 435533

ASK
London House
68 Upper Richmond Road
London SW15
01-874 6046

Bubble Bus Software
87 High Street
Tonbridge
Kent TN9 1RX
(0732) 355962

CDS
Silver House
Silver Street
Doncaster DN1 1HL
(0302) 21134

Computer Mates Ltd
PO Box 2
Houghton Down
Stockbridge
Hampshire SO20 6LE
(0264) 810824

DK 'Tronics
Unit 6
Shire Hill
Ind. Estate
Saffron Walden
Essex
(0799) 26350

Electric Software Ltd
8 Green Street
Willingham
Cambridge CB4 5JA
(0954) 81991

Hisoft
180 High Street North
Dunstable
Beds LU6 1AT
(0582) 696421

Kemp Ltd
43 Muswell Hill
London N10
01-444-5499

Knights TV and Computers
108 Rose Mount Place
Aberdeen AB2 4YW
(0224) 630526

Konami Ltd
269 Field End Road
Eastcote
Middlesex HA4 9LS
01-429 2446

Kuma Computers Ltd
Unit 12
Horseshoe Park
Horseshoe Road
Pangbourne
Berks RG8 7JW
(07357) 4335

Level 9 Computing
229 Hughenden Road
High Wycombe
Buckinghamshire
HP13 5PG
(0494) 26871

Llamasoft Ltd
49 Mount Pleasant
Tadley
Hants RG26 6BN
(07356) 4478

Longman Software
Longman House
Burnt Mill
Harlow
Essex CM20 2JE
(0279) 26721

Mastertronic Ltd
Park Lorne
111 Park Road
London NW8 TJL
01-935 4944

M.C.Lothlorien
56A Park Lane
Poynton
Cheshire SK12 1AE
(0625) 876642

Megacycal Software Ltd
PO Box 6
Birkenhead
Merseyside
L43 6XH
051-652 3139

Micro Aid
25 Fore Street
Praze, Camborne
Cornwall
TR14 OJX
(0209) 831274

Microcom
67 Gestridge Road
Kingsteignton
Devon
TQ12 3HJ
(0626) 60473

Microsoft
Piper House
Hatch Lane
Windsor
Berks
(07535) 59951

Mirrorsoft
Mirror Group Newpapers
Holborn Circus
London EC1 1DQ
01-822 3971

Morwood
Maple Walk
Bexhill
East Sussex TN39
(04243) 5840

Mr Micro Ltd
69 Partington Lane
Swinton
Manchester
M27 3AL
061-728 2282

Music Sales
78-79 Newman St
London W1T 3LA
01-636 7777

Nemesis
2 Iffley Road
London W6 OPA
01-846 9701

Ocean Software
Ocean House
6 Central Street
Manchester M25 5NS
061-832 6633

Office Junior
Market Place
Oundle
Nr Peterborough
PE8 4BA
(0832) 72127

Orpheus Software
The Smithy
Unit 1
Church Farm
Hatley St George
Nr Sandy
Beds SG19 3HP
(0767) 51481

Panasonic (UK) Ltd
300-318 Bath Road
Slough
Berks SL1 6JB
(75) 34522

PSS
452 Stoney Stanton Road
Coventry CV6 5DG
(0203) 667556

Quicksilva Ltd
Palmerston Park House
13 Palmerston Road
Southampton SO1 1LL
(0703) 20169

Silversoft
London House
271 King Street
London W6
01-748 4125

Software Projects
Bearbrand Complex
Allerton Road
Woolton
Liverpool L25 7FS
(051) 428 9393

Sony (UK) Ltd
Sony House
South Street
Staines
Middlesex TW18 4PF
(81) 61688

Spectravideo Ltd
165 Garth Road
Morden
Surrey SM4 4LM
01-330 0101

Tasman Software Ltd
Springfield House
Hyde Terrace
Leeds LS2 9LN
(0532) 438301

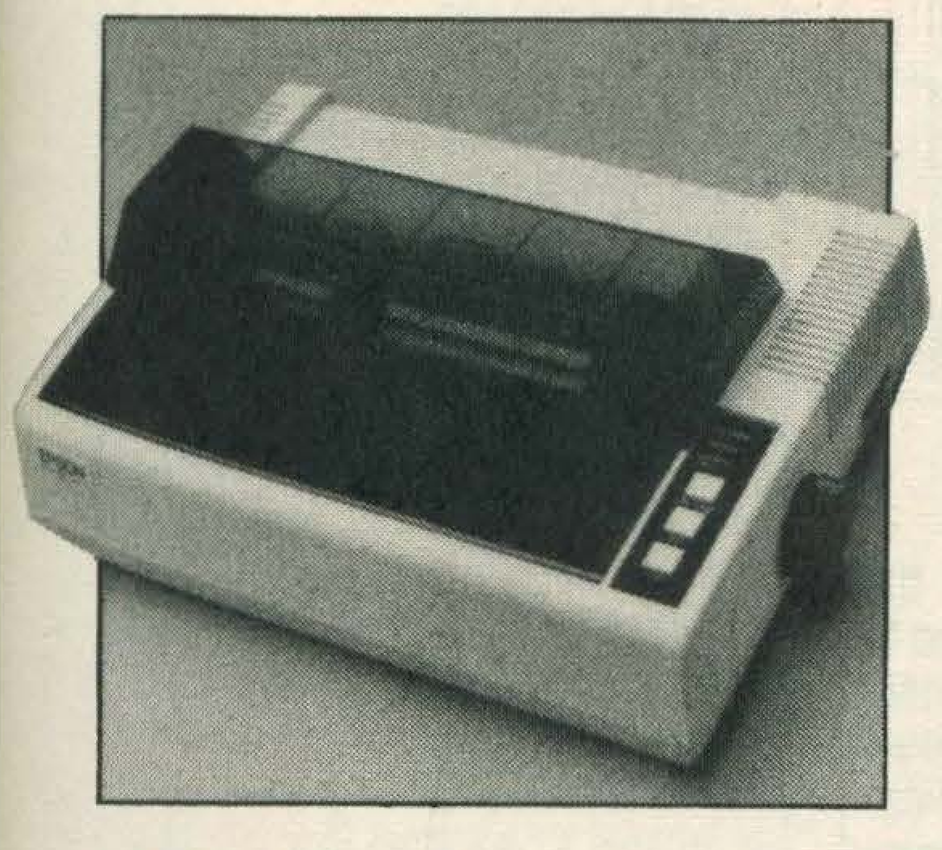
Terminal Software
Derby House
Derby Street
Bury BL9 ONW
061-761 4321

Toshiba (UK) Ltd
Toshiba House
Frimley Road
Frimley, Camberley
Surrey GU16 5JJ
(0276) 62222

Virgin Games
2-4 Vernon Yard
Portobello Road
London W11 2DX
01-727 8070

Visions
1 Felgate Mews
Studland Street
London W6 9JT
01-748 7478

What MSX?



Over the next 15 pages you'll find all the information you need to build up a complete MSX system



Confused by computers? Puzzled by peripherals? Stonkered by software? Here are the answers — or at least the information that will get you on the right track. This is as comprehensive a guide as has been humanly possible to compile of the MSX computer scene. It details machines, peripherals and programs that are, or are due to be, available.

It is divided into six sections, over the next 16 pages.

We kick off with a diagrammatic overview of an MSX computer system — what plugs into what, what different things to do and so forth. Be warned, there's no such thing as a complete system. You'll be bankrupt before you get anywhere near buying all the things that you can use with your MSX computer.

The first main listing is a comparative chart of all currently available MSX computers. Many are reviewed in this issue of What MSX? The comparative table shows how they stack up against each other for price, features and so forth. You should be able to compile a shortlist if you haven't already settled on a favourite machine.

If you're a games player, you must consult the buyers' guide to joysticks. Here you'll find details of all kinds of joysticks, including paddles, remote control units, trackballs, and so forth. The aliens will never stand a chance!



To improve the quality of your image, consult the buyers' guide to monitors. We've the facts on just about every monitor costing less than £500. If you think that your games look good on the domestic television, wait till you see what a monitor does to them. We've got a full explanation of all the terms you'll meet in the monitor world too.

For hard print, the buyers' guide to printers has all the hard facts. Over 100 printers are listed, costing up to £1,000 or so. Some are super fast, others offer super quality. Some do colour, some run silently. Some can be used as an electronic typewriter, others as viewdata terminals. There's a tremendous variety of printers to choose from, and this guide should put you on the right path.

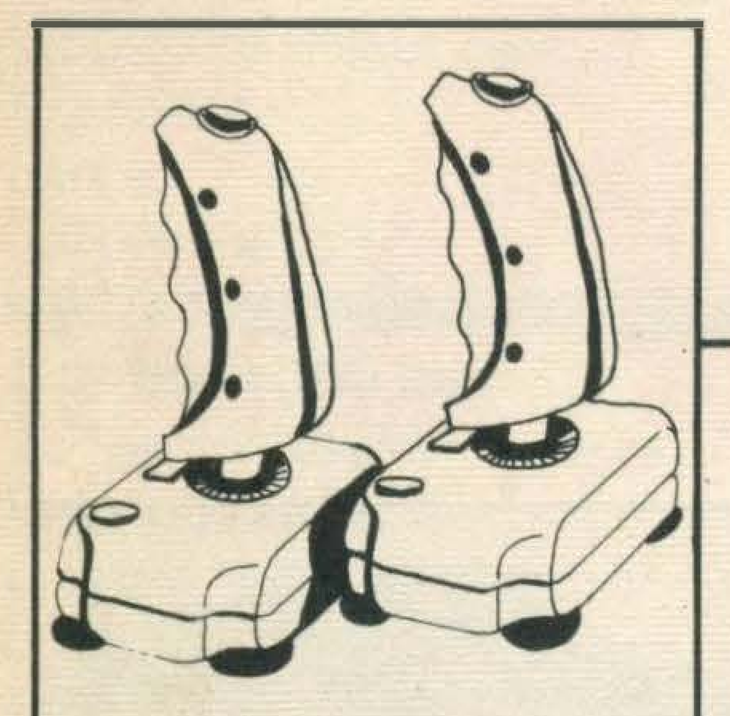
The last section of the Buyers' Guide lists MSX software. Some of it may not be available immediately, but is promised for the near future.

As there are so many software packages available, we've grouped them into categories. These are games, education, business, utility and other. We've listed the supplier of each package, and you'll find addresses and 'phone numbers of suppliers. Some of the software may not be available through your local MSX dealer, so you may have to order direct.

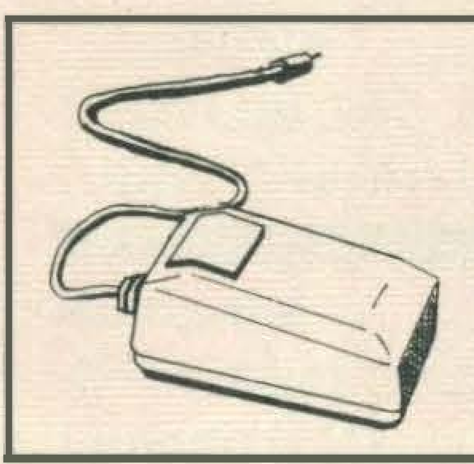
Prices throughout are approximate only. Peripherals may be discounted, particularly if they are popular and widely available. Computer prices can vary from shop to shop too. Check out advertised prices.

With the huge amount of MSX hard and software arriving on the market, we're sure you'll find just what you are looking for to make your MSX system do what you want it to.

TALKING COMPUTERS

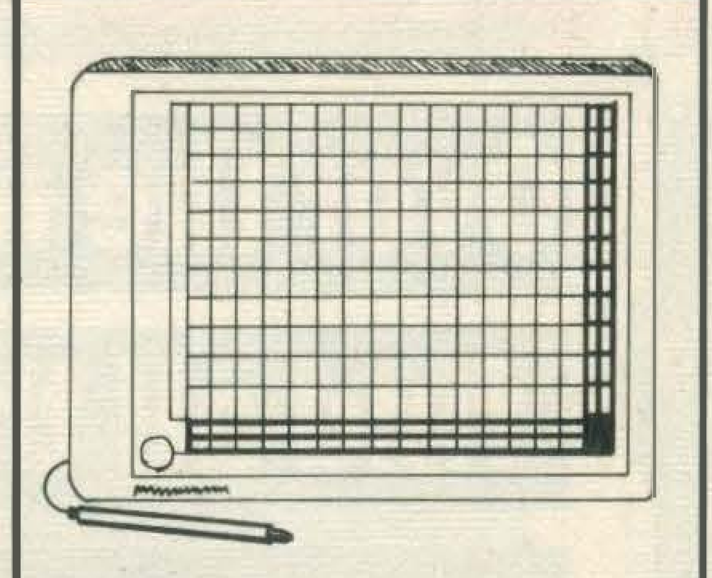


JOYSTICK
The most popular games controller, the joystick has one of two fire buttons and relays the player's movements to the computer. Some joysticks are available with continuous fire buttons for the cheats among us!

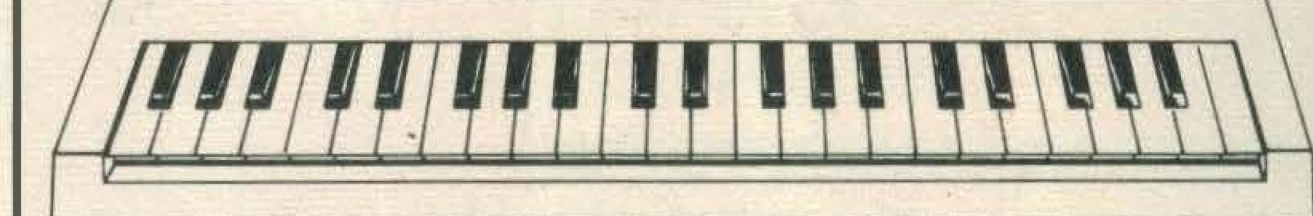


MOUSE
An alternative way to control the screen cursor. Works rather like a 'rolling joystick', the mouse's movements over your desktop are mimicked by the cursor on the screen. Good for building graphics.

LIGHT PEN
The light sensitive element at the end of a light pen sends signals to the computer via a modulator which interfaces through the cartridge port. Light pens can be used for educational games, graphics or any program which involves selecting from lists (menu driven).

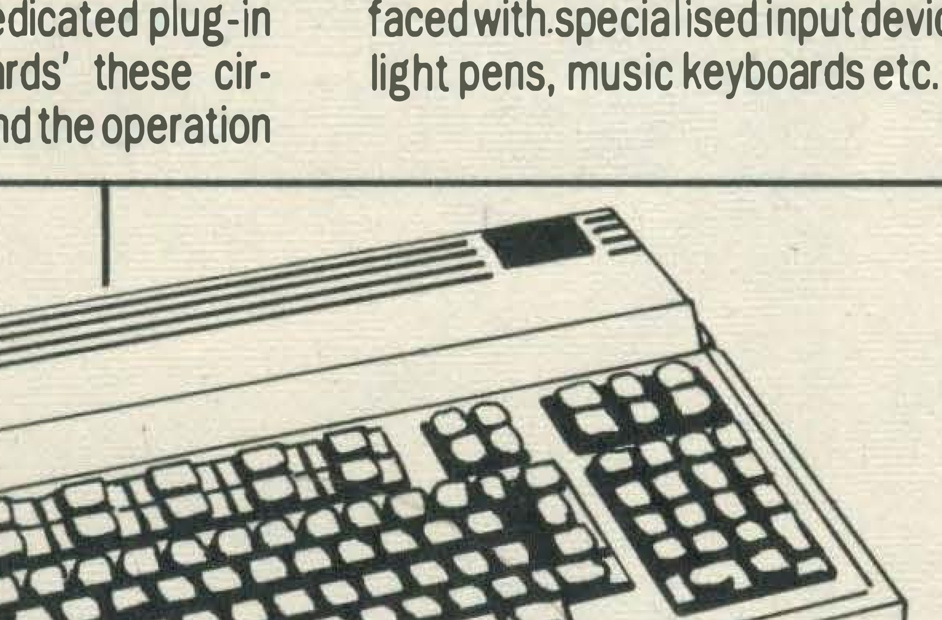


GRAPHICS TABLET
The computer equivalent of the Etch-A-Sketch! The stylus is used to draw lines on the tablet proper while the palette is used to choose colours and hatch patterns for outline filling.



MUSIC KEYBOARD
To enable computers to have quick access to music without the problems of coding or notation some manufacturers are producing 2½ or 4 octave keyboards which will plug in to interface cards for the MSX expansion bus.

INTERFACES
The 50pin input/output socket (**expansion bus**) on the MSX computer offers expansion possibilities through the use of dedicated plug-in modules. Called 'cards' these circuits can either expand the operation of the micro (an 80 column card for word processing or a data cartridge) or enable the computer to be interfaced with specialised input devices, light pens, music keyboards etc.



LANGUAGES
Computer languages are coded instructions. There is a wide variety of languages available each with its own application. MSX BASIC spoken here!

High level languages are computer languages easily understood by you and I but not by the processor.

Low-level languages (like Machine Code) are much closer to the language of the processor but are difficult to read by humans and hard to edit. The benefit of programming in a low level language is the higher speed at which it runs.

BASIC. This stands for Beginners' All-purpose Symbolic Instruction Code. Though developed as an introductory language it has now become one of the most widely used languages for home computing. Various dialects exist.

MSX BASIC. This is the extended version of BASIC written by the MicroSoft Corporation as used on all MSX computers.

ASSEMBLERS etc
Assembler. Correctly called assembly language, this exists between the high level programming language and Machine Code which it generates. Assembler carries over some of the benefits of a high level language (labels etc) yet is fast to run.

Compiler. This is a program which translates your program into Machine Code—permanently. Compiled programs are quick to run but very hard to edit.

Interpreter. Unlike the compiler, an interpreter translates your program into Machine Code one line at a time. This makes programs slower to run but relatively easy to edit.

CPU
The **Central Processor Unit** is simply a vast array of electronic switches which can either be on or off. These two states are represented by binary (base two) notation; there are two binary digits (**bits**), namely 0 and 1.

Machine Code. This is the language of the processor. This is called a low-level language because it is removed from the quasi-English of a high-level language like BASIC.

KEYBOARD
The Keyboard is the traditional interface between humans and the computer. The standard QWERTY layout is supplemented by some special keys on the MSX keyboard. The **function keys** marked F1-F10 allow complex commands to be entered at one key stroke.
Four **cursor keys** are used to move the cursor up, down and across the screen. Some games programs can be played with just the cursor keys and require no joystick control.

A **GRAPH** (Graphics) key allows the QWERTY keyboard to enter symbols with one key stroke. The GRAPH key works like the SHIFT key.

The full 73 key set is made up with four keys which allow insertion and deletion, one which returns the cursor to the top left of the cleared screen and one, SELECT, which is of use in WP and data entry programs but has no use in BASIC.

MEMORY
RAM (Random Access Memory) the amount of memory quoted in K (Kilobyte).

ROM (Read Only Memory) this is the memory 'set up' by the manufacturer. MSX Basic language is stored here. Like RAM this is quoted in K.

Byte. Memory is determined by the number of characters which can be stored. A character is coded by an 8 bit binary word which is called a byte.

Kilobyte. As computer mathematics are binary (to the base of 2) the nearest binary number to 1000 is 1024. 1024 Bytes make one Kilobyte. Megabyte and Gigabyte are terms for even larger numbers of bytes.

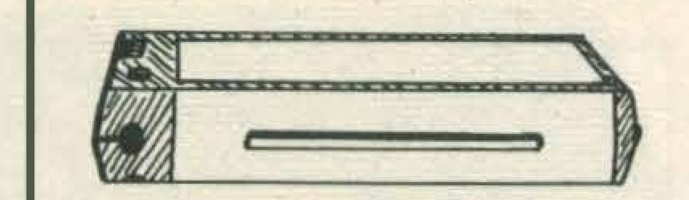
User RAM. Computers tend to use a lot of RAM when asked to generate high resolution graphics, to run other languages or specialised peripherals. User RAM is what's left over for your programming.

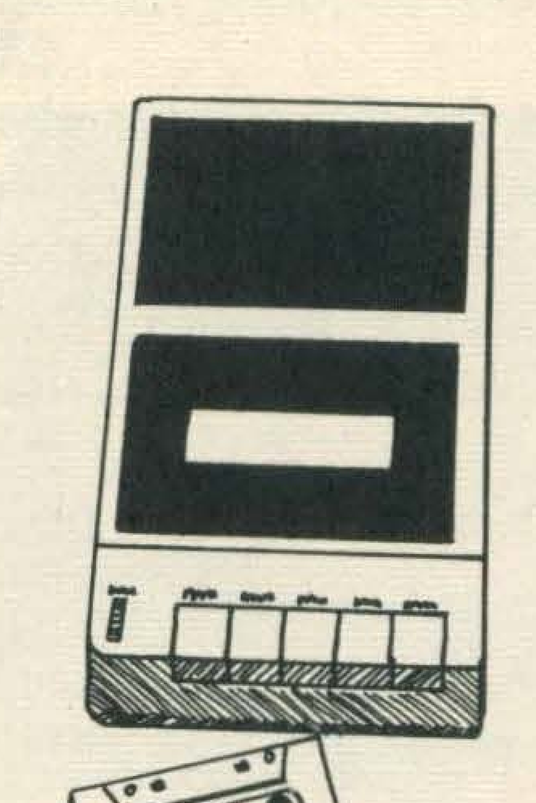
GENERAL
Software is the general term for computer programs. **Hardware** is everything else, the processor, keyboard etc. **Firmware** is software stored in a 'hard' form, cartridges and ROM chips are good examples.

Peripherals. The bolt-on goodies. This term covers, printers, plotters, joysticks, monitors and the like.

VDUs. A general term for a visual output; stands for Visual Display Unit and covers monitors, and TVs.

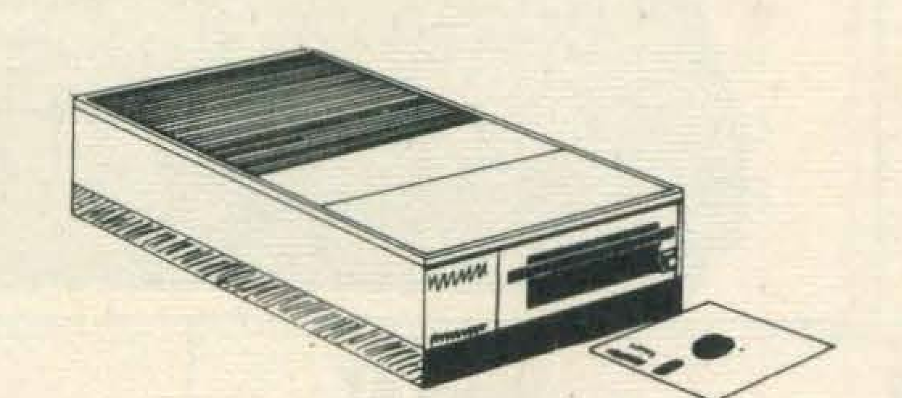
CARTRIDGE
The quickest way to load a program, but as yet the most expensive. Programs are permanently stored on a micro chip in the cartridge case which interfaces through a 50 pin cartridge socket.





DATA STORAGE AND RETRIEVAL
Disks and **Compact Cassettes** are the most common forms of permanent data storage. Both are magnetic record/erase devices. Disks offer faster access to a greater amount of stored information. Cassettes are slow but cheap.

Disks are divided up into tracks and sectors. The computer needs to know where data has been stored; this 'housekeeping' function is run by a program called the Disk Operating System (**DOS**). The **MSX-DOS** (Micro-Soft Extended Disk Operating System) is used by MSX machines. **CP/M DOS** (Control Program for Micros) is data compatible.



PRINTERS AND PLOTTERS
Dot matrix printers build up the patterns of letters and characters by a bank of pins striking through an inked ribbon. Print quality varies from terrible to good.

Daisywheel printers are named after the spinning disc which carries the type elements on its spokes. The very highest print quality can be achieved but speed and character set is often limited.

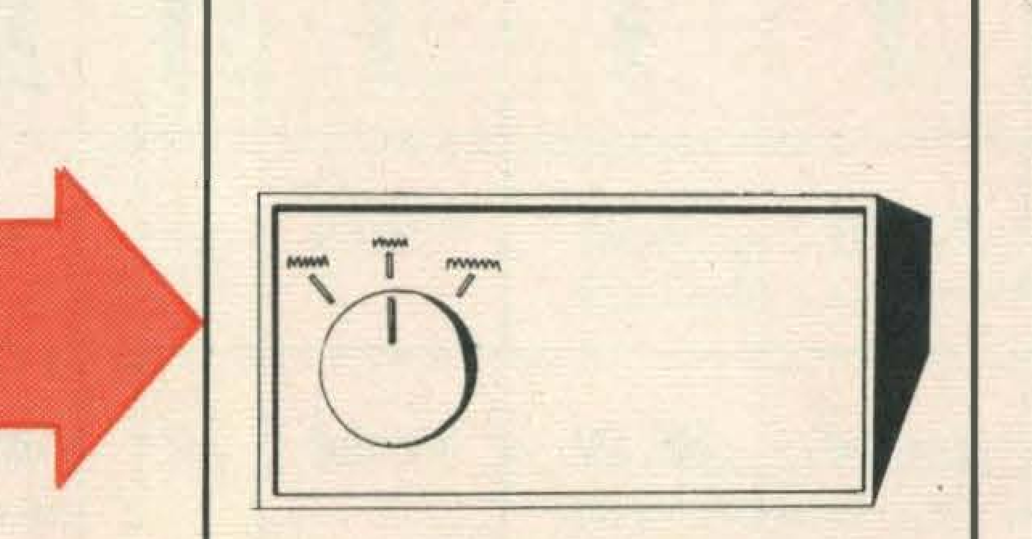
Plotters. These draw graphs and diagrams with a pen and can be either of the flat bed or platen type. A choice of pen colour is often offered.

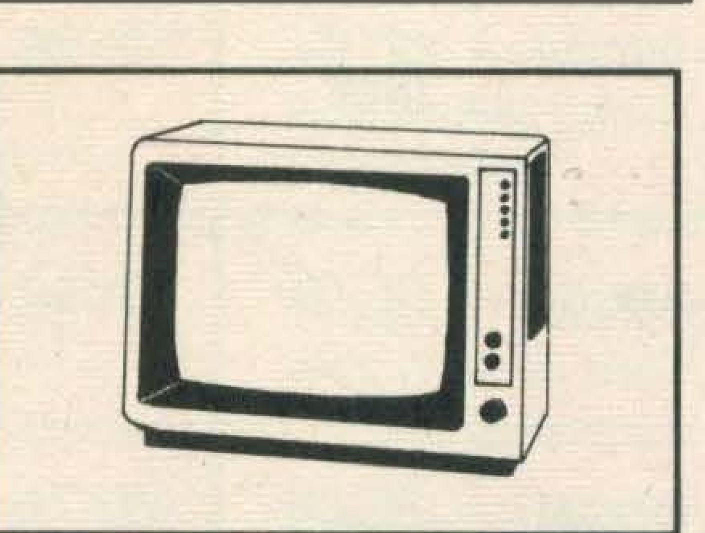
Thermal printers. These offer fast, quiet but limited quality print often on especially treated paper which reacts with heat to show visible lettering. Material costs and print quality are often a deciding factor against such printers.

DATA TRANSMISSION
Computers can be networked to enable one user to talk to others individually or together through 'electronic mailboxes'. The telephone system can be used via special adapters to let one computer talk to others.

Modem stands for Modulator/Demodulator, a Modem turns the telephone system into a giant cable between distant computers. The Modem is a 'black box' which converts the low voltage digital signals from the computer into an analogue signal which can be transmitted over the 'phone system.

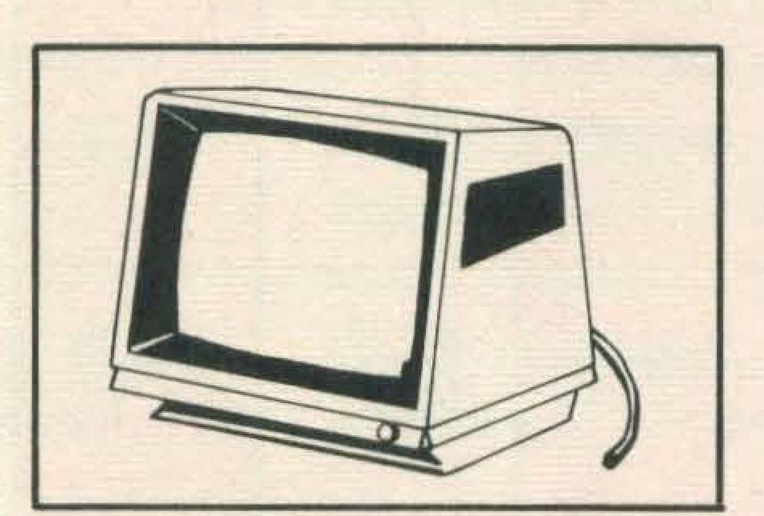
An **Acoustic Coupler** is a more portable and often cheaper way of interfacing a computer with the 'phone network'. Here the computer output is used through a modulator or to drive a telephone handset through a microphone and loudspeaker. Portable couplers offer the businessman instant access to his data base back at the office.





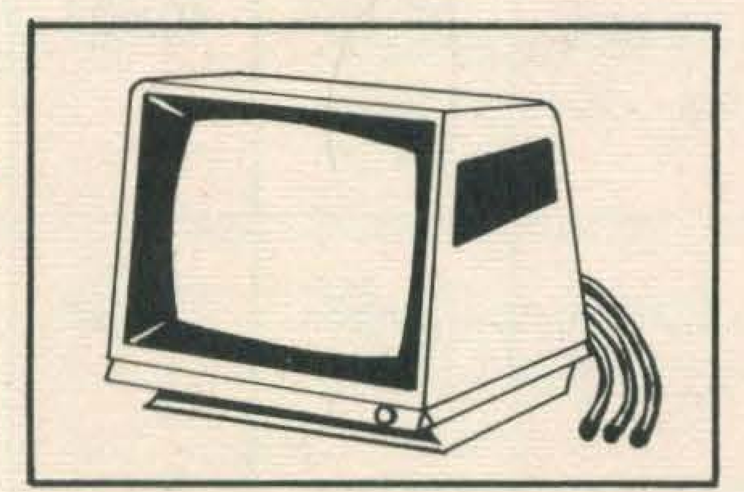
GETTING A PICTURE
All MSX computers will give sound and pictures from a standard **TV** set through their UHF output. A dedicated **monitor** will give better resolution from the video output while the audio output can be taken to a hi-fi system if the monitor has no built in loudspeaker. **RGB** outputs allow individual control over the Red, Green and Blue electron guns in the monitor colour and can be used to produce high quality graphic images.

TEXT
Computers are frequently used for **word processing**, to write letters or reports. Most text displays give 37 characters (or 40) by 24 lines. Real word processor packages reform the text screen to 80 characters (some to 64 characters wide). Powerful editing facilities enable the user to delete and insert words, phrases or paragraphs, to search for and correct spelling. Dictionary programs can also be bought.





AUDIO AND VIDEO





SOUND
Computers have conventional audio outputs which can be used to drive the tape or tuner input of any hi-fi system. MSX computers have three separate channels of sound, and a fourth channel of noise. Stereo outputs are possible. A computer can be used to define the precise waveform of a sound just in the manner of a synthesiser.

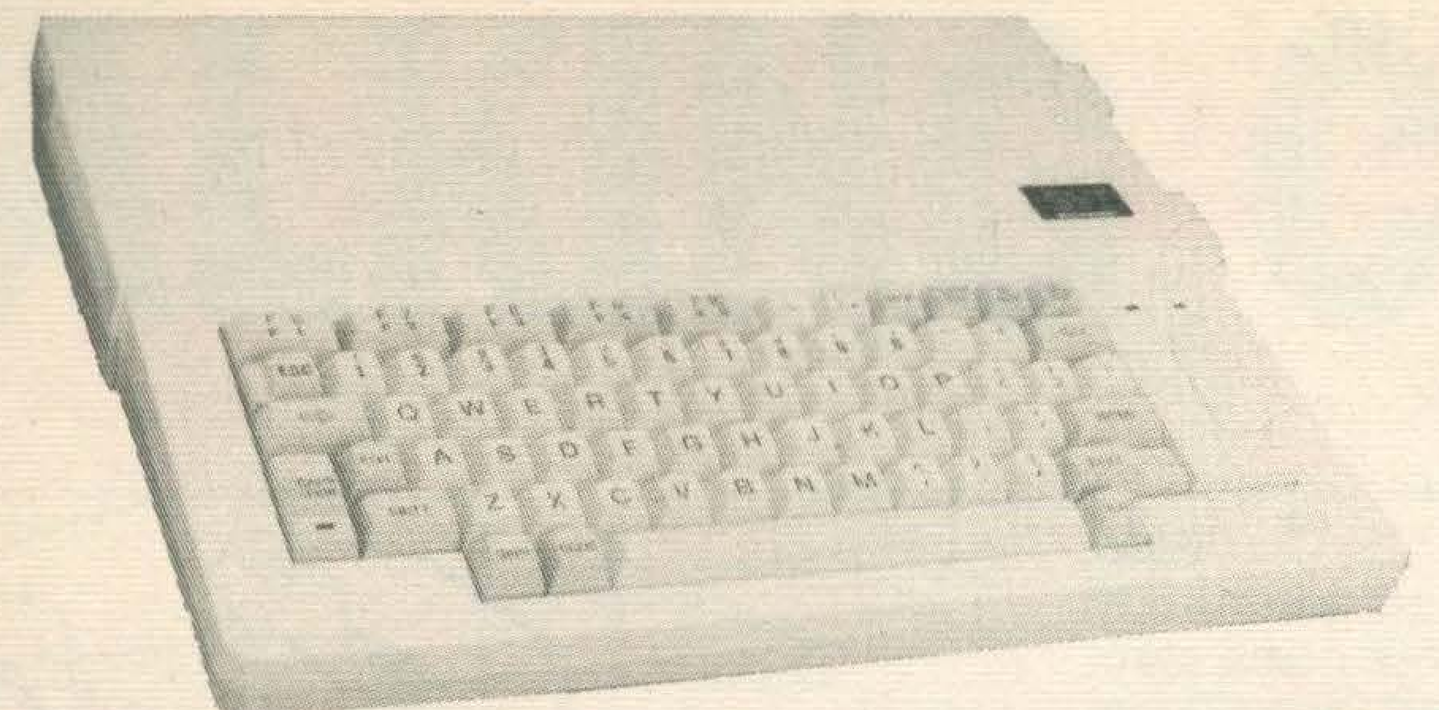
GRAPHICS
The smallest unit of 'graphic information' is the **pixel**. This can be thought of as the dot from which graphics can be built up. The MSX system uses a screen of 49152 pixels arranged in 256 columns of 192 lines.

Sprites are independently programmable groupings of pixels which form a recognisable character which can be 'addressed' around the screen.

16 colours are available to the programmer working in MSX.



BUYERS GUIDE



Spectravideo X'Press £400

Spectravideo was largely responsible for developing the MSX standard in the first place, but until now has kept very much in the background. The X'Press, when it is eventually launched by Spectravideo, will be the first MSX business oriented machine. Its features include a built-in 3.5 inch disk drive, RS232C inteface and an 80 column card.

With these facilities both MSX-DOS and CP/M operating systems can be used.

It's a formidable computer and if it does sell for £400, the X'Press will be hard to beat.

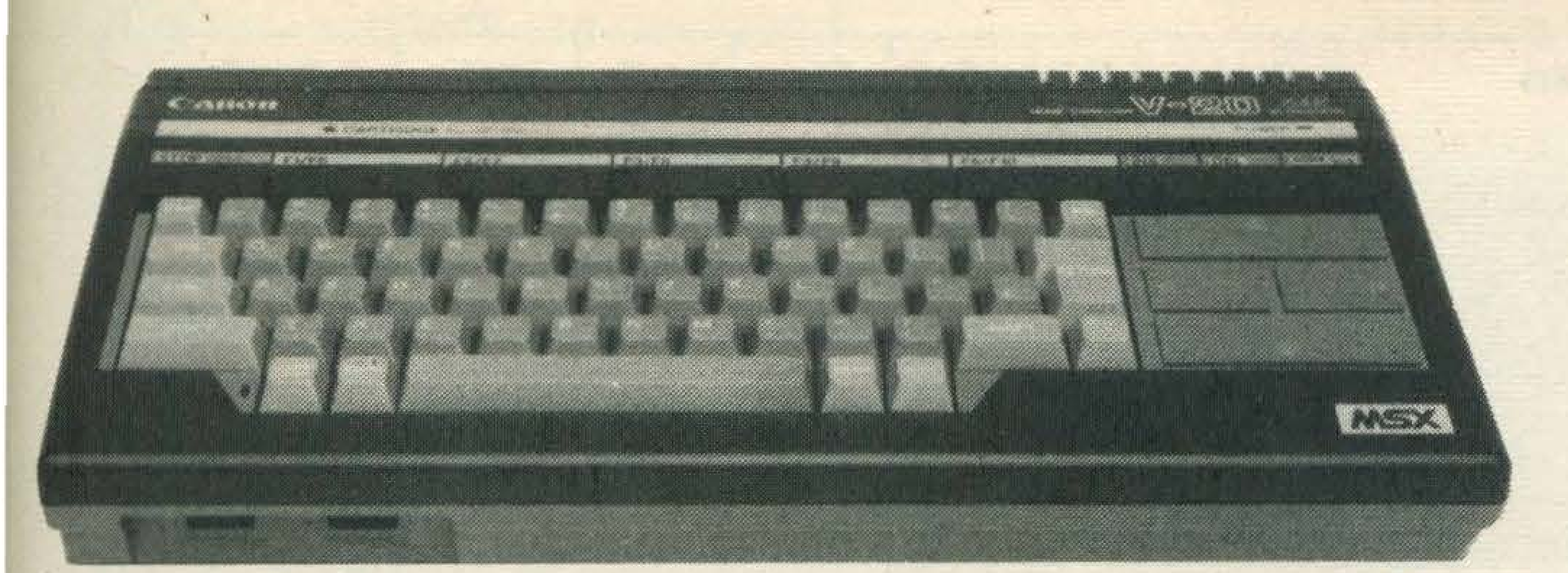
Toshiba HX-22 £79

In the wake of drastic price cutting on its HX-10 micro, Toshiba is introducing the superior specification HX-22. Offering an RS232C interface for communications, a built-in word processor and an improved keyboard, the HX-22 comes in at £249.99, only £10 more than the previous price of the HX-10.

The HX-22 seems an ideal choice for the more 'serious' user. Its word processor is the best we've seen so far on MSX, and comms software for the RS232C is included in the interface cartridge. Due in the shops before Christmas, this is certainly a machine to look out for.



COMPUTER			MEMORY			KEYBOARD			DISPLAY		INTERFACES						
Maker	Model	Price	Total RAM	RAM	ROM Contents	Type	Numeric Keypad	Cursor	Output	Text format	Joysticks	Expansion bus	Cartridge port	Printer	Serial port	Cassette	Output
Canon	V-20	£280	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	—	2	Centronics	—	DIN	Mon
Goldstar	FC-200	£139	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mon
JVC	HC-7	£99	80K	64K	32K Microsoft MSX BASIC	72 key, full stroke	No	Keypad	RF, CV, RGB	40×24	2	—	2	Centronics	—	DIN	Mon
Mitsubishi	ML-F48	£219	48K	32K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mor
Mitsubishi	ML-F80	£275	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mor
Panasonic	CF2700	£280	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	—	2	Centronics	—	DIN	Mor
Pioneer	PX-7	£300	48K	32K	32K Microsoft MSX BASIC 8K P-BASIC	76 key, full stroke	No	Keypad	RF, CV RGB	40×24	2	—	2	Centronics	—	DIN	Mo
Sanyo	MCP-100	£299	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mo
Sony	HB-75	£299	80K	64K	32K Microsoft MSX BASIC Sony Firmware	75 key, full stroke	No	Keypad	RF, CV, RGB	40×24	2	—	2	Centronics	—	DIN	Mo
Spectra-video	SVI-728	£250	80K	64K	32K Microsoft MSX BASIC	90 key, full stroke	Yes	Keys	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mo
Toshiba	HX-10	£79	80K	64K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mo
Yamaha	CX5M	£449	48K	32K	32K Microsoft MSX BASIC	73 key, full stroke	No	Keypad	RF, CV	40×24	2	Yes	1	Centronics	—	DIN	Mo



Canon V-20 £280

Canon are perhaps better known for their cameras and copiers. This is their only MSX micro and it conforms to standard 64K specifications. The attention-grabbing feature is the extra large cursor keypad that is excellent for games playing. There are two joystick ports too, and the price is a little lower than the top range MSX rivals.

Canon's peripherals are limited to a joystick, though they do make non-MSX printers. They are keeping a low profile in the market, with machines available mainly through Comet and Spectrum shops. The V-20 has few distinctive features, but does all a 64K MSX micro should.

JVC HC-7 £99

In the light of recent, drastic price cuts (see this issue's news pages), the JVC looks a very attractive buy. The HC-7 is a standard 64K MSX machine blessed with excellent styling and quality throughout.

There are no 'special' features, although JVC does have plans for an interface with video disc. As for peripherals, it currently has a joystick and several data recorders available, plus a disk drive waiting in the wings.

For £99, you're getting a stylish, but standard MSX machine with nice key response and study construction. What more could you ask?



SOUND			OTHER				
Reset button	Built-in storage	Power supply	Software supplied	Accessories supplied M = monitor lead C = cassette lead RF = TV lead	Distributor	Reviewed	Comments
No	No	Built-in	None	M, C, RF	Canon (UK) Ltd, Canon House, 2 Manor Rd, Wallington, Surrey SM6 0AJ	Nov '84	Canon's effort isn't a world beater, but it does a more than adequate job
No	No	Built-in	Demo, 1 game	M, C, RF	Microdealer (UK) Ltd, 29 Burrowfields, Welwyn Garden City, Herts AL7 4SS	Mar '85	The emphasis is on value for money and durability
Yes	No	Built-in	1 utility, 1 game	M, C, RF	JVC, JVC House, 12 Priestley Way, Eldon Wall Trading Estate, Staples Corner, London NW2	Nov '84	JVC offer style and support plus a 'branded' expansion into music and video accessories
No	No	Built-in	Demo, 6 games	M, C, RF	Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD	Mar '85	Plenty going for it and excellent value for money to boot
No	No	Built-in	Demo, 6 games	M, C, RF	Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD	Nov '84	Those after a reliable, solid MSX computer won't go far wrong
No	No	Built-in	None	M, C, RF	Panasonic UK Ltd, 300-318 Bath Rd, Slough, Berks SL1 6SB	Mar '85	The style of the Panasonic does make it stand out from the crowd
Yes	No	Built-in	None	M(3), RF, CPU keyboard	Pioneer High Fidelity, 116 Field Way, Greenford, Middlesex UB6 8UZ	Sep '85	Pioneer's micro includes the P-BASIC language turning it into a video controller
Yes	No	Built-in	Demo, 3 games	M, C, RF	Sanyo Marubeni (UK) Ltd, Sanyo House, 8 Greycaine Rd, North Watford, Herts WD2 4UQ	Nov '84	The Sanyo is one of the best MSX machines in terms of quality
Yes	No	Built-in	3 utilities (built-in)	M, C, RF	Sony (UK) Ltd, Sony House, South St, Staines, Middx TW18 4PF	Nov '84	The Sony HB-75 shows what the MSX standard could be all about
No	No	External	None	M, C, RF, Transformer	Spectravideo Ltd, 165 Garth Rd, Morden, Surrey SM4 4LH	Nov '84	It is more a business than a games machine
No	No	Built-in	Demo, 3 games	M, C, RF	Toshiba Ltd, Toshiba House, Frimley Rd, Frimley, Camberley, Surrey	Nov '84	One of the first and most numerous of the MSX machines
No	No	External	Voicing prog	YK-01 keyboard, M, C, RF	Kemble-Yamaha Music (UK) Ltd, Mount Ave, Bletchley, Milton Keynes MK1 1JE	Mar '85	As a synthesizer for the home, it is a super instrument

BUYERS GUIDE

KEY

Type: M — Dot matrix printer. The image is printed by the impact of pins from a pin matrix, the particular pins determining the shape of the character. Dot matrix printers are very fast.

D — Daisywheel printer. These printers work rather like electronic typewriters, using a daisywheel of formed characters. Quality is high, but speeds are slower and you are limited to the characters on the daisywheel.

T — Thermal printer. The print head is heated, thus transferring ink to paper, using a matrix of needles. These printers run very quietly.

I — Inkjet printer. Squirts of ink are directed at the paper to form the characters. It is all relatively new and pricey.

Matrix size: Applicable only to dot matrix and thermal printers — the number of pins used to form a character. Maximum figures are given, the more, the better the quality.

Maximum speed: The number of characters per second (cps) that can be printed.

Paper width: The maximum width of paper the printer will take in inches.

Paper feed: T — Tractor feed. Continuous paper, perforated at the edges, is used and width is adjustable.

P — Pinfeed. As tractor feed, but paper width is fixed.

F — Friction feed. The sort of feed found on typewriters, for one sheet of paper at a time.

Graphics: B — Block graphics. Prints using set characters provided by the printer.

H — Hi-res graphics. The printer can print anything that appears on the screen, in text or graphics modes.

Interface : C — Centronics. The printer interface found on MSX computers.

R — RS232C. An alternative printer interface that can be added to MSX computers.

Other: D — the printer will print the lower portion of characters that extend below the line (g,j etc.)

M — the printer has a slower printing speed to give near letter quality printing.

B — the printer is battery powered.

C — the printer prints in more than one colour.

K — the printer has a

Model	Type	Matrix Size	Max Speed	Paper Widths	Paper Feed	Graphics	Interface	Other	Price	Supplier
ACT Writer 11	M	9 x 9	100cps	10	T,F	H	C	D	£327	ACT
ACT Writer 12	M	9x 7	163cps	—	T,F	H	C	D	£799	ACT
ACT Writer 12S	M	9 x 7	180cps	15	T,F	H	C	D	£799	ACT
ACT Writer 12FC	D	NA	180cps	15	T,F	H	C	D,C	£914	ACT
Brother HR5	M	9 x 9	30cps	8	F	H	C,R	B,D	£236	Brother
Brother EP44	M	24 x 18	16cps	8	F	—	R	K,B	£261	Brother
Brother HR15	D	—	13cps	13.5	F	—	C,R	D,C	£512	Brother
Brother HR25	D	NA	25cps	16.5	T,F	—	C,R	D,C	£863	Brother
Canon T-22A	T	5 x 7	56cps	10	F	H	C	D	£160	Canon
Canon PW1080A	M	11 x 9	160cps	10	T,F	H	C	D	£401	Canon
Canon PW1156A	M	11 x 9	160cps	17	T,F	H	C	D	£516	Canon
Canon PJ1080A	I	7 x 9	37cps	8.5	F	H	C	C	£574	Canon
Centronics GLP 30101-6	M	9 x 9	50cps	8	T,F	H	C	D	£234	Centronics
Centronics Horizon 80	M	11 x 9	160cps	12	T,F	H	C	D,M	£392	Centronics
Centronics Horizon 156	M	11 x 9	160cps	16.5	T,F	H	C	D,M	£572	Centronics
Citizen 560P	M	7 x 5	65cps	3½	F	B	C,R	C	£126	Datac Ltd
Citizen 510	M	5 x 7	45cps	3	F	B	C,R	—	£217	Datac
C. Itoh 7500	M	9 x 9	105cps	11	T,F	B	C	—	£373	C. Itoh
C. Itoh 8510S	M	9 x 9	180cps	11	T,F	H	C,R	D	£598	C. Itoh
C. Itoh 8510SC	M	9 x 9	180cps	11	T,F	H	C,R	D,C	£633	C. Itoh
C. Itoh 1550S	M	9 x 9	180cps	15	T,F	H	C,R	D	£748	C. Itoh
C. Itoh 1550SC	M	9 x 9	180cps	15	T,F	H	C,R	D,C	£863	C. Itoh
Colourjet 132	I	5 x 8	40cps	8	F	H	C	C,D	£654	Integrex
Daisystep 2000	D	NA	20cps	13	F	—	C	—	£334	Micro P.
Dyneer DW16	D	NA	16cps	10	F	H	C	D	£329	X-Data
Dyneer DW20	D	NA	20cps	15	F	H	C,R	D	£535	X-Data
Epson P-40	T	7 x 9	45cps	4	F	H	C	D,B	£100	Epson
Epson RX-80/T	M	9 x 9	100cps	10	T	H	C	D	£286	Epson
Epson GX-80	M	9 x 9	100cps	10	T,F	H	C,R	D,M	£286	Epson
Epson LX-80	M	9 x 9	100cps	10	T,F	H	C,R	D,M	£293	Epson
Epson RX-80/FT	M	9 x 9	100cps	10	T,F	H	C	D	£328	Epson
Epson FX-80	M	9 x 9	160cps	10	T	H	C	D	£503	Epson
Epson DX100	D	NA	13cps	11	F	—	C,R	—	£546	Epson
Epson TX-80	M	9 x 9	160cps	10	T	H	C	D	£644	Epson
Epson MX-100	M	9 x 9	100cps	16	T	H	C	D	£546	Epson
Epson FX-100	M	9 x 9	80cps	16	T	H	C	D	£654	Epson
Getex D14	D	NA	13cps	13.5	F	—	C,R	—	£288	Geveke
Getex S11CQ	M	9 x 7	100cps	—	T,F	H	C,R	D	£516	Geveke
Getex S31 CQ	M	9 x 7	100cps	15.5	T,F	H	C,R	D	£460	Geveke
Honeywell L11-1	M	9 x 9	80cps	—	T,F	H	C	D	£401	Geveke
Honeywell S11-CQ	M	16 x 35	100cps	—	T,F	H	R	M,D	£516	Geveke
Honeywell L31CQ	M	11 x 9	150cps	12	T	B	C	D	£776	Geveke
Janome CP1018	M	—	180cps	13	T	B	C	C,D	£892	Thame Systems
Juki 5510	M	9 x 9	180cps	10	T,F	H	C,R	—	£401	Micro P
Juki 6100	D	—	20cps	15.5	F	H	C	—	£458	Micro P
Juki 5520	M	9 x 9	180cps	10	T,F	H	C,R	C	£516	Micro P
Kaitec KAI180	M	9 x 9	180cps	10	T,F	B,H	C,R	M,D	£401	Hudson
Kaitec KAI1800	M	9 x 9	180cps	16	T,F	B,H	C,R	M,D	£528	Hudson
Mannesman Tally 80	M	9 x 7	80cps	10	T,F	B	C,R	D	£250	Mannesman Tally
Mannesman Tally 160	M	9 x 7	160cps	10	T,F	B	C,R	D	£631	Mannesman Tally
Micro P CPA80	M	8 x 9	100cps	10	T,F	B	C	D,M	£229	Micro P
Micro P 165	M	9 x 9	165cps	10	T,F	H	C	D,M	£309	Micro P
Mitsui 2200	M	9 x 9	180cps	10	F	H	C	D	£516	Thame
Mitsui 4200	M	9 x 9	180cps	15	F	H	C	D	£643	Thame
NEC PC 8023	D	9 x 7	120cps	9	T,P,F	H,G	C	D	£229	NEC
NEC Pinwriter P2	M	7 x 9	180cps	10	T,F	—	C,R	D,M	£747	NEC
OKI Microline 182	M	9 x 9	120cps	10	P,F	B	C	D	£299	X-Data
OKI Microline 192	M	9 x 9	160cps	10	P,F	H	C	D	£399	X-Data
OKI Microline 193	M	9 x 9	160cps	15.5	T,F	H	C	D	£549	X-Data
OKI Microline 84	M	9 x 9	200cps	15.5	T,F	—	C	D,M	£799	X-Data
Olivetti DM5060	M	9 x 7	120cps	—	F	H	C	D	£459	Olivetti
Olivetti DM4100	M	9 x 7	120cps	—	T,F	H	C	D	£666	Olivetti
Olympia Compact	D	NA	14cps	13.5	T,F	—	C,R	—	£459	Intelligent
Olympia ESW 102	D	NA	17cps	17	F	—	C,R	—	£650	Intelligent

Model	Type	Matrix Size	Max Speed	Paper Widths	Paper Feed	Graphics	Interface	Other	Price	Supplier
Panasonic KXP-1091	M	9 x 9	120cps	10	T,F	H	C	D,M	£367	Northamber
Panasonic KXP-1092	M	9 x 9	180cps	10	T,F	H	C	D,M	£505	Northamber
Panther DX109	M	9 x 9	96cps	10	T,F	H	C	D	£229	Datac
Panther II DX120	M	9 x 9	120cps	10	T,F	H	C	D,M	£367	Datac
Paper Tiger 8010	M	36 x18	180cps	9	T,F	H	C,R	D,M	£539	Data-prod
Paper Tiger 8020	M	36 x 18	180cps	14	T,F	H	C,R	D,M	£642	Data-prod
Qume Letter Pro 20	D	NA	20cps	13	F	—	R,C	—	£604	Qume
Riteman C +	D	9 x 9	120cps	10	T,F	H	C,R	D,M	£276	C.Itoh
Riteman F +	D	9 x 9	105cps	10	T,F	H	C,R	D,M	£310	C.Itoh
Riteman II	D	9 x 9	160cps	10	T,F	H	C,R	D,M	£344	C.Itoh
Riteman 15	D	9 x 9	160cps	10	T,F	H	C,R	D,M	£575	C.Itoh
Remstar 201	D	NA	13.3cps	13.5	F	—	C,R	K,D	£454	PMS
Seikosha GP-50A	M	5 x 8	40cps	5	F	H	C	—	£100	DRG
Seikosha GP-500A	M	5 x 7	50cps	10	T	—	C,R	—	£180	DRG
Seikosha 100A	M	5 x 7	50cps	10	T	—	C,R	—	£169	DRG
Seikosha GP-550A	M	9 x 8	50cps	10	P,F	H	C	M,D	£230	DRG
Seikosha GP-250X	M	5 x 7	50cps	10	P,F	H	C,R	D	£270	DRG
Seikosha 700A	M	5 x 8	50cps	10	P,F	H	C,R	C	£350	DRG
Shinwa CPA80	M	13 x 9	100cps	10	T,F	8	C	D	£229	Micro P
Silver Reed EXP400	D	NA	12cps	12	F	—	C,R	D	£288	Silver Reed
Silver Reed EXP500	D	NA	16cps	13	F	—	C,R	D	£615	Silver Reed
Silver Reed EXP550	D	NA	19cps	17	F	—	C,R	D	£654	Silver Reed
Smith Corona Fastext80	M	9 x 8	80cps	11	T,F	H	C	D	£195	Smith Corona
Smith Corona TP1	D	NA	11cps	13	F	—	R	D	£250	Smith Corona
Smith Corona L1000	D	NA	12cps	13	F	—	C,R	D	£265	Smith Corona
Smith Corona D200	M	17 x 18	160cps	11	T,F	H	C,R	M,D	£397	Smith Corona
Smith Corona D300	M	17 x 18	160cps	15	T,F	H	C,R	M,D	£596	Smith Corona
Samleco DT-80	M	11 x 9	30cps	8.5	F	H	C	D	£115	Samleco
Samleco DX-85	M	9 x 9	120cps	10	P,F	H	C	D	£220	Samleco
Samleco DX-135	M	9 x 9	120cps	15	T,F	H	C	D	£332	Samleco
Samleco DX-86	M	9 x 9	120cps	10	P,F	H	C	D	£343	Samleco
Sanple Daisy Junior	D	—	136cps	10	P,F	—	C,R	—	£252	Hudson
Shinwa JP-80B	M	7 x 8	80cps	10	F,T	8	C,R	D	£206	Hudson
Shinwa JP-100A	M	7 x 8	100cps	10	F,T	8	C,R	D	£229	Hudson
Shinwa JP-130A	M	9 x 9	130cps	10	F,T	8	C,R	D	£263	Hudson
Shinwa LP-1510	M	9 x 9	130cps	16	F,T	8	C,R	D	£378	Hudson
Star STX-80	T	9 x 10	60cps	10	F	8	C	D	£182	Star
Star SG10	M	9 x 9	120cps	10	F	8,H	C	D	£297	Star
Star FG15	M	9 x 9	120cps	15	F	8	C	D	£447	Star
Star Power type	D	NA	18cps	10	F	—	C	D	£436	Star
Star FD10	M	9 x 11	160cps	10	T,F	8	C,R	D	£447	Star
Star FT15	M	9 x 11	160cps	15	T,F	8	C,R	D	£562	Star
Star FR10	M	9 x 11	200cps	10	T,F	8	C,R	M,D	£562	Star
Star FR15	M	9 x 11	200cps	15	T,F	8	C,R	M,D	£677	Star
Tandy CGP115	I	—	12cps	4.5	P	—	C	C	£150	Tandy
Tandy DMP120	M	9 x 9	120cps	10	T,F	8	C	—	£399	Tandy
Tandy DMP420	M	9 x 9	140cps	14.5	T,F	8,M	C,R	D	£499	Tandy
Taxan KP-810	M	9 x 9	140cps	10	T,F	H	C,R	D	£389	Data E
Taxan KP-910	M	9 x 9	140cps	17	T,F	H	C	D	£493	Data E
Tensho TMP100	T	16 x 16	50cps	10	F	H	C,R	D	£252	Hudson
Texas 850	M	9 x 7	150cps	10	T,F	H	C,R	D,M	£799	Texas Instruments
Toptronic 15	D	NA	13cps	13.5	F	H	C,R	—	£375	PMS
Toptronic 15	D	—	13.3	13.5	F	—	C,R	K,D	£431	PMS
Toshiba HX-P570	Pens	NA	–cps	12	F	H	C	C,D,G	£250	Toshiba
Toshiba HX-P550	M	—	105cps	16	F	H	C	D,G	£350	Toshiba
Triumph Adler TRD 7020	D	NA	20cps	14	F	—	C,R	D	£431	Triumph Adler
Triumph Adler DRH 80/1	M	7 x 9	80cps	12	T,F	H	C,R	D	£520	Triumph Adler
Triumph Adler DRH 136	M	7 x 9	120cps	—	T,F	H	C,R	D,M	£621	Triumph Adler
Turbo20	D	NA	20cps	15	F	—	C	—	£344	OEM
VRX80	M	7 x 9	100cps	9.5	T,F	H	C,R	D	£454	Integrex

keyboard, so can be used as a typewriter.

F — the printer can be used as a viewdata terminal.

G — the printer can print MSX graphics.

ADDRESS

ACT — (021) 503 0666
Brother Office Equipment — 061-330 6531
Canon (UK) Ltd — (0256) 473232
Centronics — 01-581 1011
C. Itoh Electronics Co. Ltd — 01-946 4960
Datac Ltd — 061-941 2361
Data Efficiency — (0442) 60155
Dataproducts (Retail Division) Ltd — (0734) 884777
DRG Business Machines — (0934) 419914
Epson — 01-902 8892
Geveke Electronics — (04867) 88676
Hudson — 01-458 3310
Integrex Ltd — (0283) 215432
Intelligent Interfaces — (0789) 296879
Mannesman Tally Ltd — (0734) 788711
Micro Peripherals — (0256) 473232
NEC — 01-267 7000
Newbury Data — (0784) 61500
Northamber — 01-391 2066
OEM Peripherals — 01-748 8404
Olivetti — 01-785 6666
Panasonic — (75) 73181
PMS Developments — (0432) 265768
Qume (UK) Ltd — (0734) 584646
Samleco — (07535) 54717
Silver Reed (UK) Ltd — (0923) 45976
Smith Corona Data Products — 01-900 1222
Star Micromics — 01-840 1800
Tandy Corp — (0922) 648181
Texas Instruments — (0234) 67466
Thame Systems — (084) 421 6698
Toshiba (UK) Ltd — (0276) 62222
Triumph Adler — 01-253 5608
X-Data — (0753) 72331

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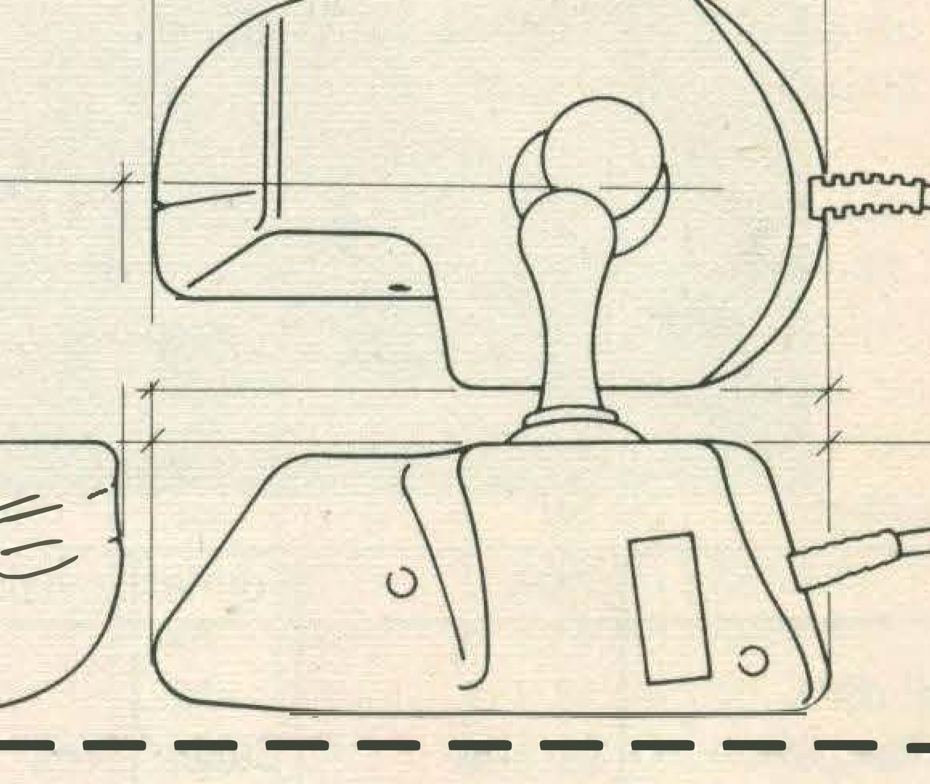
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Title	Type	Format	Joystick	Price	Supplier
Weedy	Arcade	Cass	Yes	£3.95	Microcom
Yie-Ar Kung Fu	Arcade	Cart	Yes	£14.95	Konami
Zakil Wood	Adventure	Cass	No	£7.95	Mr Micro
Zaxxon	Arcade	Cass	Yes	£11.95	Electric
Zenji	Arcade	Cass	Yes	£11.99	Activision
Zipper	Arcade	Cass	Yes	£3.95	Kuma

EDUCATIONAL

Title	Type	Format	Joystick	Price	Supplier
3D Hypermath	Maths	Cass	Yes	£7.95	Longman
Adder Sums	Maths	Cass	No	£14.95	Ampalsoft
BMX Number Jump	Maths	Cass	Yes	£7.95	Longman
Calculation 1	Maths	3 Cass	No	£9.95	Morwood
Calculation 2	Maths	3 Cass	No	£9.95	Morwood
Challenge My Bluff	General	2 Cass	No	£9.95	Soft Cat
First Steps	General	Cass	Yes	£8.95	Mirrorsoft
French Is Fun	Language	Cass	No	£7.95	CDS
Fun Sums	Maths	Cass	No	£14.95	Ampalsoft
Fun With Words	Reading	Cass	No	£14.95	Ampalsoft
Funwords	Spelling	Cass	No	£9.95	Soft Cat
German Is Fun	Language	Cass	No	£7.95	CDS
Gods Of The Tomb	General	Cass	No	£9.20	Megacycal
Here & There	General	Cass	No	£7.95	Mirrorsoft
Introducing Circle 1	Maths	Cass	No	£7.95	Spectravideo
Introducing Circle 2	Maths	Cass	No	£7.95	Spectravideo
Intro Percentages	Maths	Cass	No	£7.95	Spectravideo
Intro To BASIC	BASIC	Cass	No	£6.95	Spectravideo
Intro To Numbers	Maths	3 Cass	No	£9.95	Morwood
Italian Is Fun	Language	Cass	No	£7.95	CDS
Junior Maths	Maths	Cass	No	£5.95	Knights
Kriss Kross Quiz	General	2 Cass	No	£9.95	Soft Cat
Large & Small Numbers	Maths	Cass	No	£7.95	Morwood
Let's Go MSX	BASIC	2 Cass	No	£9.95	Soft Cat
Mastermind	General	Cass	No	£9.99	Mirrorsoft
Mastermind Quiz	General	Cass	No	£5.99	Mirrorsoft
Math Bug	Maths	Cass	Yes	£6.95	Spectravideo
Maths Invader	Maths	Cass	Yes	£7.95	Stell Software
Memory	Training	3 Cass	No	£9.95	Morwood
Monkey Academy	Maths	Cart	Yes	£14.95	Konami
MSX BASIC Tutorial	BASIC	Cass	No	£16.95	Knights
MUE	General	Cart	No	£24.95	HAL/Morwood
Number Painter	Maths	Cass	Yes	£8.95	ASK
O'Level Maths	Maths	Cass	No	£9.95	Shield
O'Level Chemistry	Chemistry	Cass	No	£9.95	Shield
O'Level Physics	Physics	Cass	No	£9.95	Shield
Quiz Safari	General	Cass	No	£9.20	Megacycal
Reasoning	Training	3 Cass	No	£9.95	Morwood
Reflexes	Training	3 Cass	No	£9.95	Morwood
Revise Computers	Computing	Cass	No	£8.50	Megacycal
Revise Physics	Physics	Cass	No	£8.50	Megacycal
Simple Addition 1	Maths	Cass	No	£7.95	Spectravideo
Simple Subtraction	Maths	Cass	No	£7.95	Spectravideo
Spanish Is Fun	Language	Cass	No	£7.95	CDS
Star Words	Spelling	Cass	No	£6.95	Spectravideo
Sum Measure	Maths	Cass	No	£14.95	Ampalsoft
Sum Takeaway	Maths	Cass	No	£14.95	Ampalsoft
Sum Times	Maths	Cass	No	£14.95	Ampalsoft
Sum Weights	Maths	Cass	No	£14.95	Ampalsoft
Teach Electricity	Physics	Cass	No	£9.20	Megacycal
The Sphinx Quiz	General	Cass	No	£9.20	Megacycal
Trigonometry	Educational	Cass	No	£7.95	Spectravideo
Typing Tutor	Typing	Cass	No	£5.95	Knights
Uni's Learning	Maths	Cass	No	£6.95	Spectravideo
Word Wobbler	Words	Cass	Yes	£7.95	Longman

BUSINESS

Title	Type	Format	Joystick	Price	Supplier
Aackobase	Database	Cass /disk	No	£39.10	Silversoft
Aackotext	Wordpro	Cass /disk	No	£39.10	Silversoft
Cards	Database	Cart	No	£49.99	Computer Mates
Cash Accounts	Financial	Cart	No	£124.99	Computer Mates
Cash Book	Accounts	Cass	No	£14.95	Micro Aid
Communications	Comm	Cass	No	£19.95	Kuma
Crediquote	Retail	Cart	No	£100.00	Office Junior
Database	Database	Cass	No	£12.95	MST
Database	Database	Cass	No	£19.95	Kuma
Financial Calculator	Financial	Cass	No	£6.95	Spectravideo
Home Accounts	Accounts	Cass	No	£12.95	MST
Home Budget	Accounts	Cass	No	£14.95	Kuma
Homewriter	Wordpro	Cart	No	£39.95	Sony
Knights BudgetA/C	Accounts	Cass	No	£14.95	Knights
Knights Mail List	Addresses	Cass	No	£14.95	Knights
Mail Shot	Cards	Cart	No	£99.99	Computer Mates
Marginator	Accounts	Cass	No	£10.00	Office Junior
Memo-Calc	Database	Cass	No	£14.95	Micro Aid
MST-Calc	Speadsheet	Cass	No	£12.95	MST
MT Base	Database	Cart	No	£49.95	MT Technology
Partsearch	Stock	Cass	No	£100.00	Office Junior
Payroll	Wages	Cart	No	£99.00	Computer Mates
Payroll	Wages	Cass	No	£29.95	Micro Aid
RS 233 Communications	Comm	Cart	—	£229.99	Comp Mates
Spectra Chequebook	Accounts	Cass	No	£6.95	Spectravideo
Shoppastoppa	Retail	Cass	No	£100.00	Office Junior
Spreadsheet	Spreadsheet	Cass	No	£29.95	Kuma
Spreadsheet	Spreadsheet	Cart	No	£49.99	Computer Mates
Stock Control	Stock	Cass	No	£34.95	Kemp
Tasprint	Printing	Cass	No	£9.90	Tasman
Tasword MSX	Wordpro	Cass	No	£13.90	Tasman
WDpro	Wordpro	Cass	No	£29.95	Kuma
Word Processor	Text	Cart	No	£49.99	Computer Mates
VAT Cracker	Financial	Cass	No	£10.00	Office Junior

UTILITIES

Title	Type	Format	Joystick	Price	Supplier
Colour Fantasia	Graphics	Cass	No	£9.95	Kuma
Champ	Assembler	Cass	No	£12.95	PSS
EDDY II	Graphics	Cart	No	£24.95	HAL/Morwood
Games Creator	Programming	Cass	Yes	£12.95	Mirrorsoft
Games Designer	Programming	Cass	Yes	£9.95	Quicksilva
Go-Sprite	Graphics	Cass	Yes	£9.95	Mirrorsoft
Graphic Designer	Graphics	Cass	No	£14.95	Electric Studio
Hisoft Devpack	Ass/Disass	Cass	No	£19.95	Hisoft
Hisoft Pascal	Pascal	Cass	No	£29.95	Hisoft
Kuma Forth	Forth	Cass	No	£39.95	Kuma
Logo	Logo	Cass	No	£19.95	Kuma
Machine Code	Assembler	Cass	No	£28.75	Knights
MSX Graphics	Graphics	Cass	No	£5.95	Knights
MT Debugger	Programming	Cart	NO	£39.95	MT Technology
Operation Caretaker	Maintenance	Cass	No	£9.95	Global
Picasso	Graphics	Cass	Yes	£9.95	Morwood
Psychedelia	Graphics	Cass	Yes	£6.00	Kuma
Speech Synthesis	Voice	Cart	No	£69.50	Kuma
Sprite Editor	Graphics	Cass	No	£6.95	Electric Studio
Tasprint MSX	Printing	Cass	No	£9.90	Tasman
Zen M/Code System	M/Code	Cass	No	£19.95	Kuma

MISCELLANEOUS

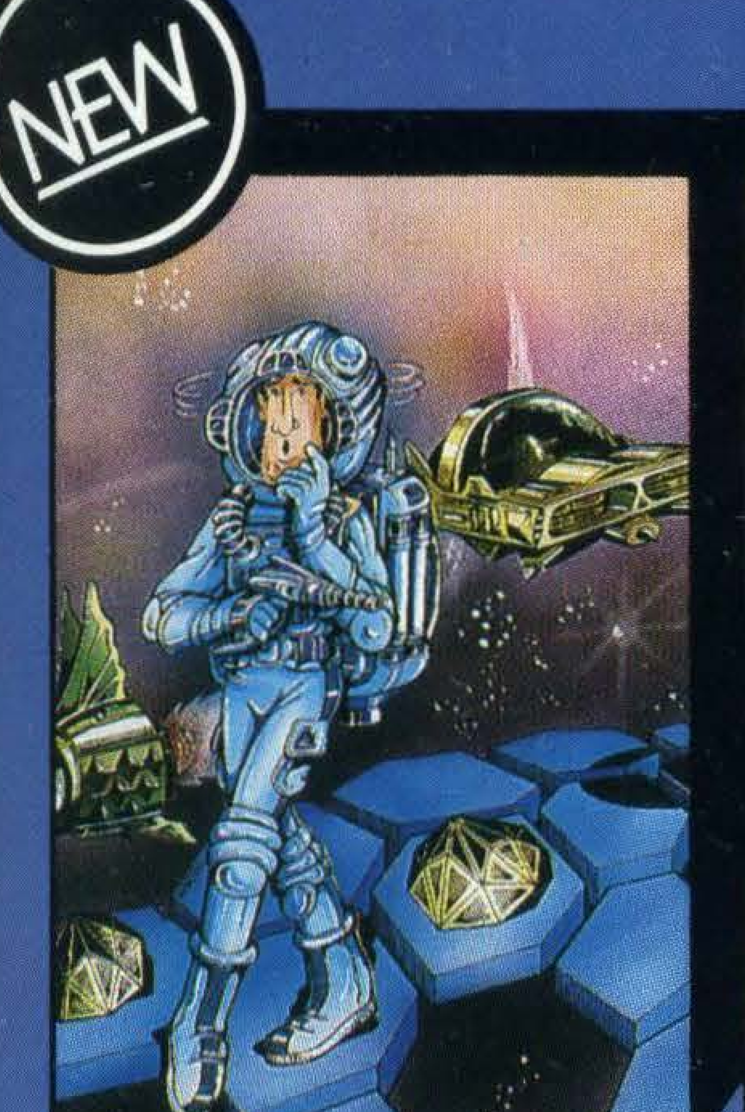
Title	Type	Format	Joystick	Price	Supplier
MSX Demonstrator	Demonstrator	Cass	No	£5.95	Knights
MT Comms	Comm	Cass	No	£79.95	MT Technology
Music Mentor	Musical	Cass	Yes	£6.95	Spectravideo
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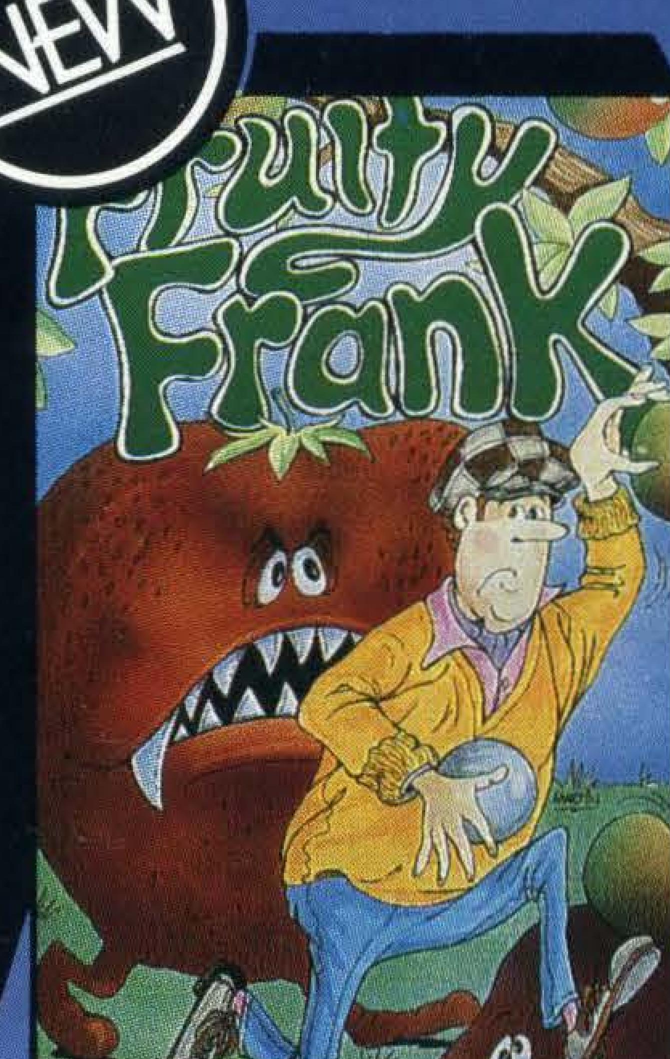
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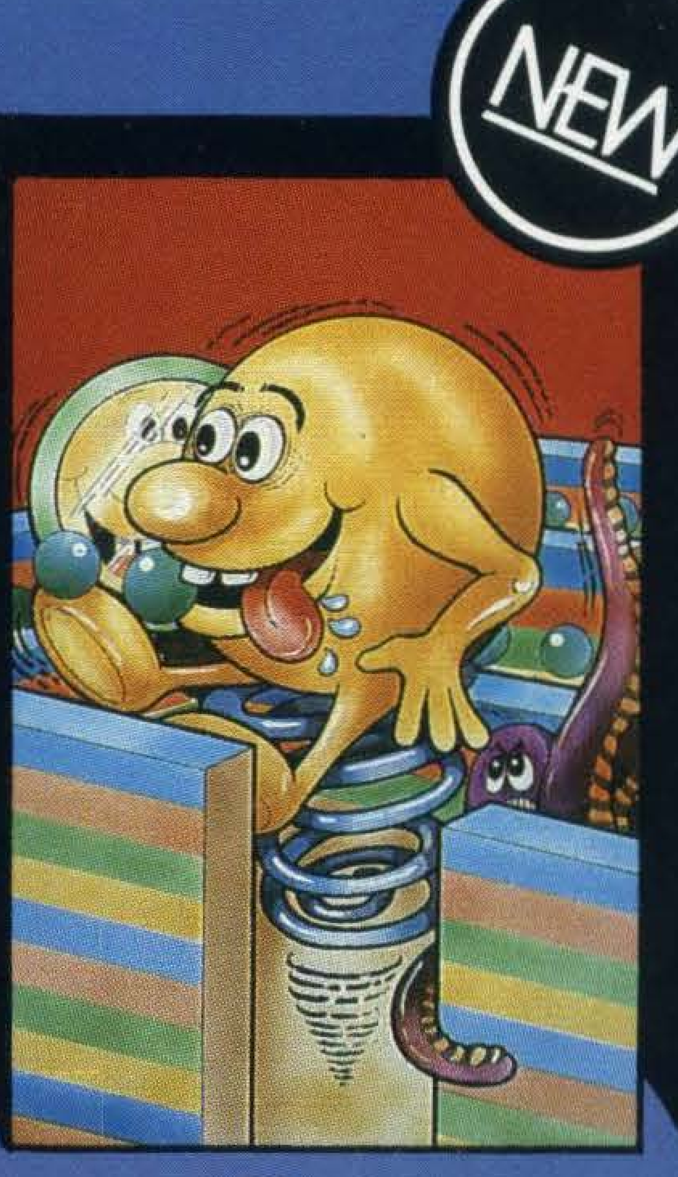




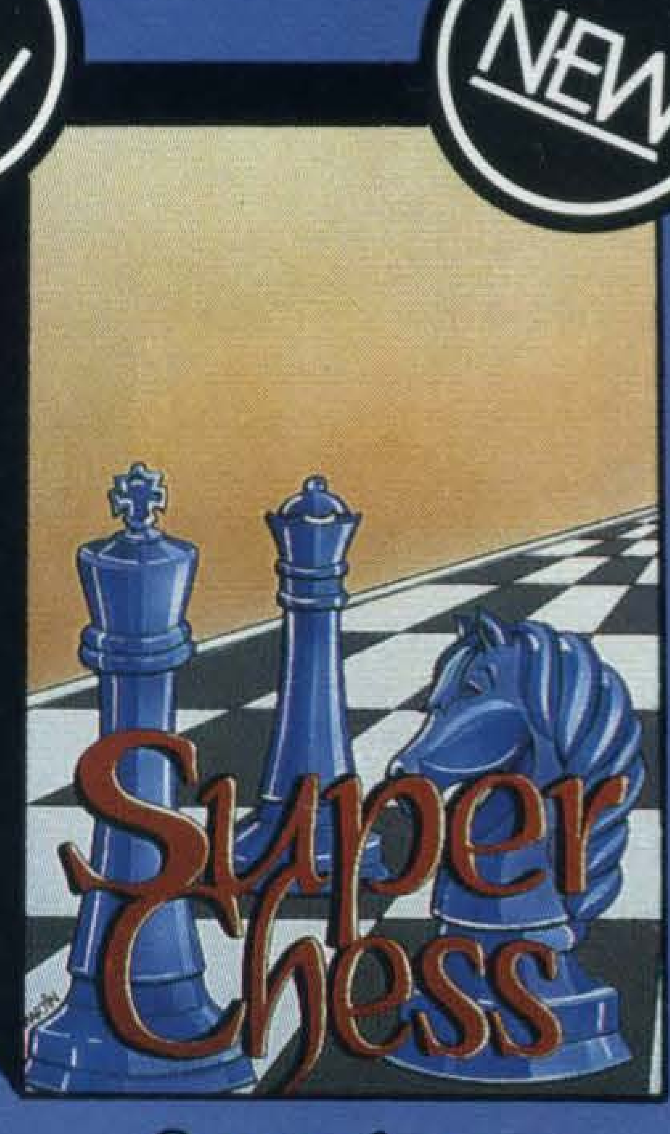
Spooks and Ladders



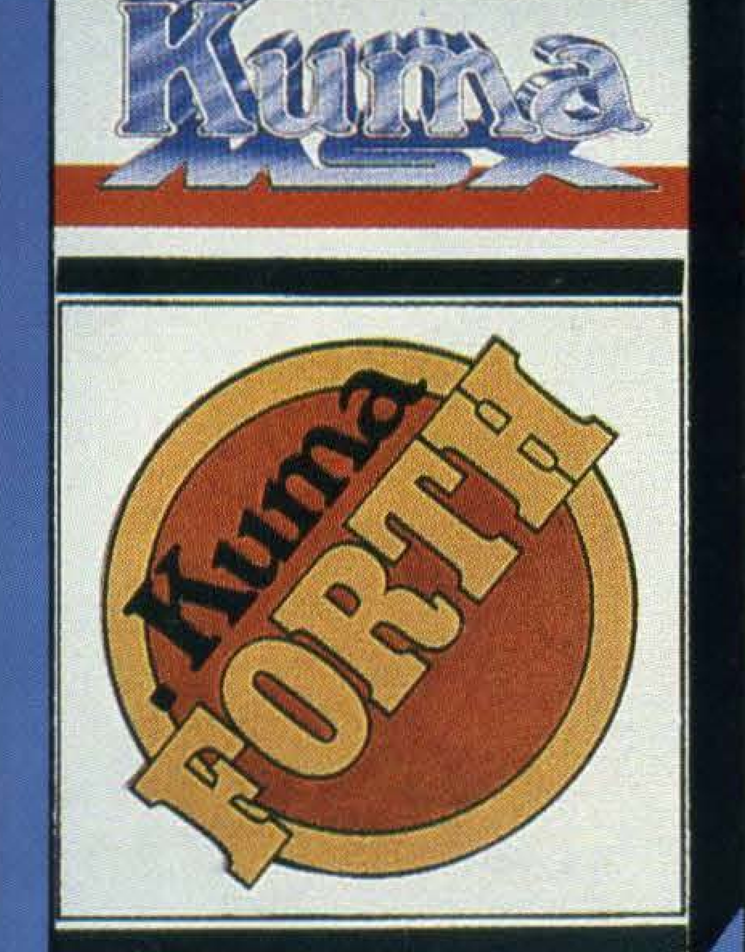
Fruity Frank



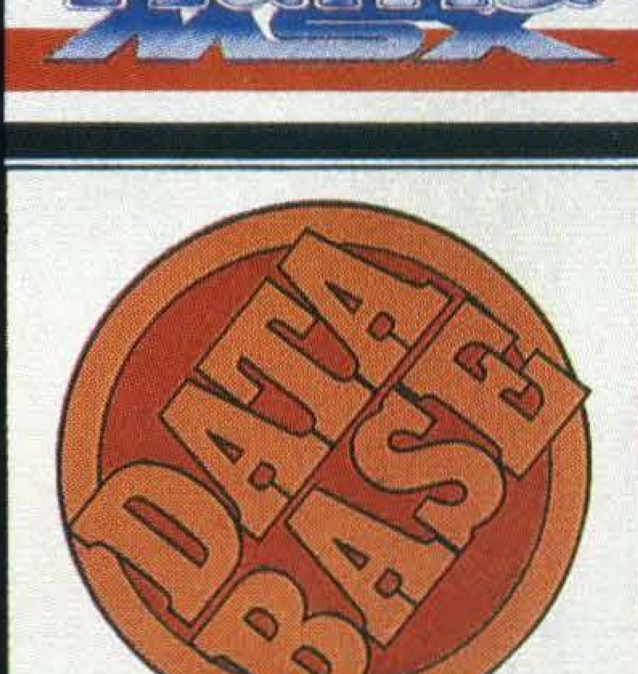
Shnax



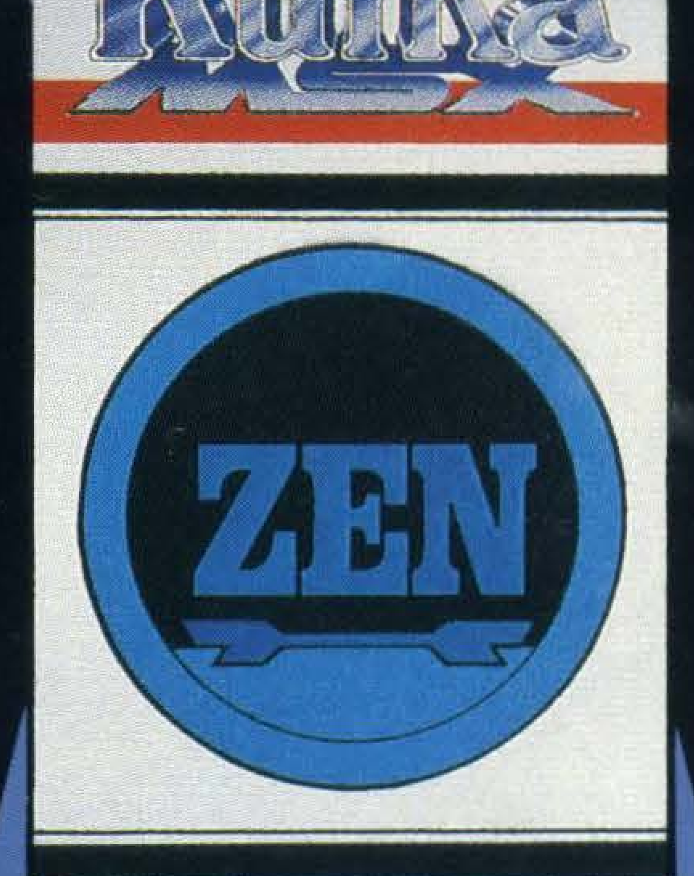
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